Digitized by the Internet Archive
in 2008 with funding from
Microsoft Corporation

http://www.archive.org/details/canadianmachv14n25torouoft

FEATURE ARTICLE—LARGE SHELLS: PRODUCTION PROBLEMS AND POSSIBILITIES—V.

CANADIAN MACHINERY AND MANUFACTURING NEWS

A weekly newspaper devoted to the manufacturing interests, covering in a practical manner the mechanical, power, foundry and allied fields. Published by the MacLean Publishing Company, Limited, Toronto, Montreal, Winnipeg and London, Eng.

Vol. XIV | Publication Office: Toronto, December 16, 1915 | No. 25

Library
Univ. of Toronto
Engi. Bldg. Fac. of
A. S. & E. Tor.

POSTAGE PAID

LIBRARY
JUN 16 1922
UNIVERSITY OF TORONTO

Holden-Morgan Mechanical Plug Wrench

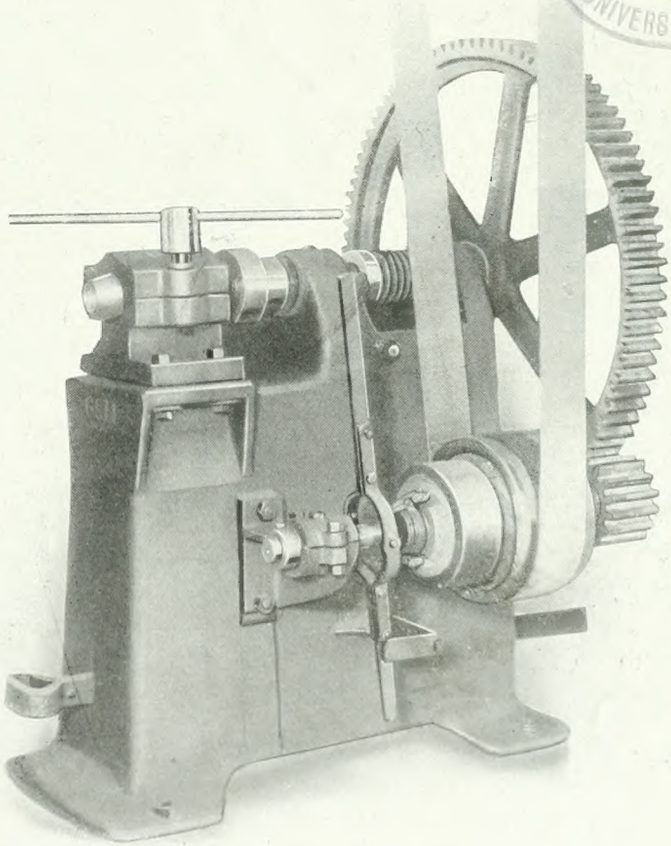
For Screwing The Base Plugs Into Shells

Output 120 per hour

One machine with an operator will do the work of four men. Friction device adjustable, and can be set for any required tension and, when set, the pressure applied will not vary from the desired adjustment.

DIRECT DRIVEN, NO COUNTERSHAFT NEEDED

The plug is screwed in and tightened up entirely by mechanical action, therefore eliminating the variations that result from band work.



CAN BE MADE TO HANDLE ANY SIZE SHELL.

Further Details on Request.

THE HOLDEN-MORGAN COMPANY, LIMITED

579 RICHMOND STREET WEST, TORONTO

FOR TAPPING NUTS

The Tap with the

Con-eccentric Land

One-third of the land from the cutting edge is concentric. The remaining two thirds has eccentric relief.

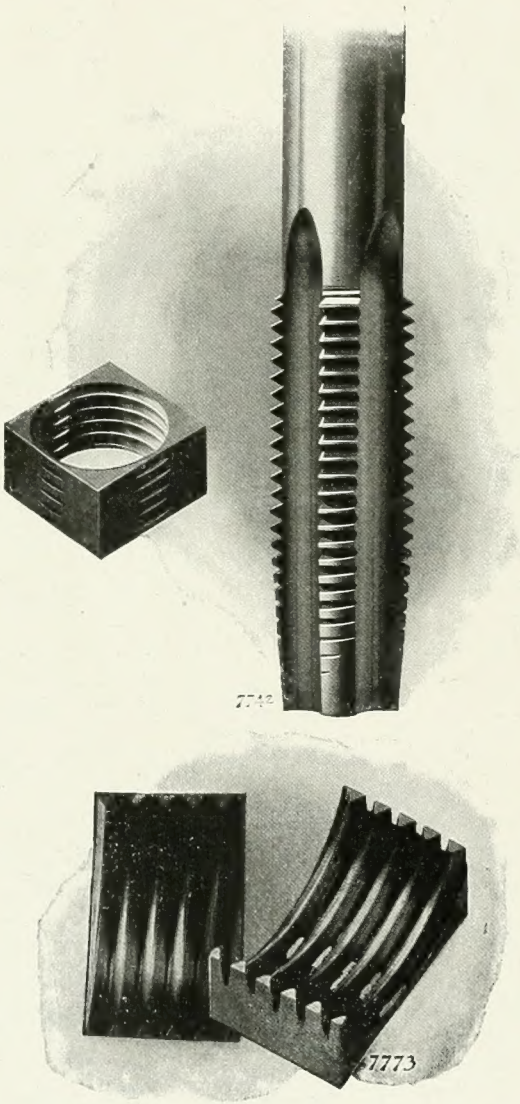
TO show more clearly the free-cutting qualities of these taps, a nut slightly smaller than one and one-quarter inches square was drilled for tapping and held lightly by the corners. The nut was then tapped with a 1¼-7 U.S.S. con-eccentric tap, driven through without reversing. (See cut on right.)

So perfect were the cutting qualities and so easily and freely was the work done that this mere shell of a nut was *not even distorted*, to say nothing of being split as would have happened with a tap differently constructed.

Consider what this means to the nut manufacturer from the standpoint of a *saving in power*. This is but one reason why Pratt & Whitney taps are specified by the largest nut manufacturers in the country.

For a number of years we have made taps with this style of relief. They have won out steadily and consistently on merit alone.

Write for our Booklet "The Tap with the Con-eccentric Land."



TAPS can be sharpened at the only correct point — on the face of the cutting edge.

Sharpening in no way affects their size.

Can be sharpened long after other so-called eccentrically-relieved taps are rendered useless.

We obtain the freest cutting tap with the longest life—an exclusive combination.

Accuracy nowhere else obtainable is secured together with a degree of finish and refinement heretofore thought impossible in a commercial tool.

We want tap users to know why Pratt & Whitney taps are best, also that our claims are based on reasons mechanically correct.

Cut to left is a tapped nut sawed in half showing small area of metal which held it together.

The taps are carried in stock by our Branch Offices and Agencies throughout the world. Prompt service assured to all customers wherever located.

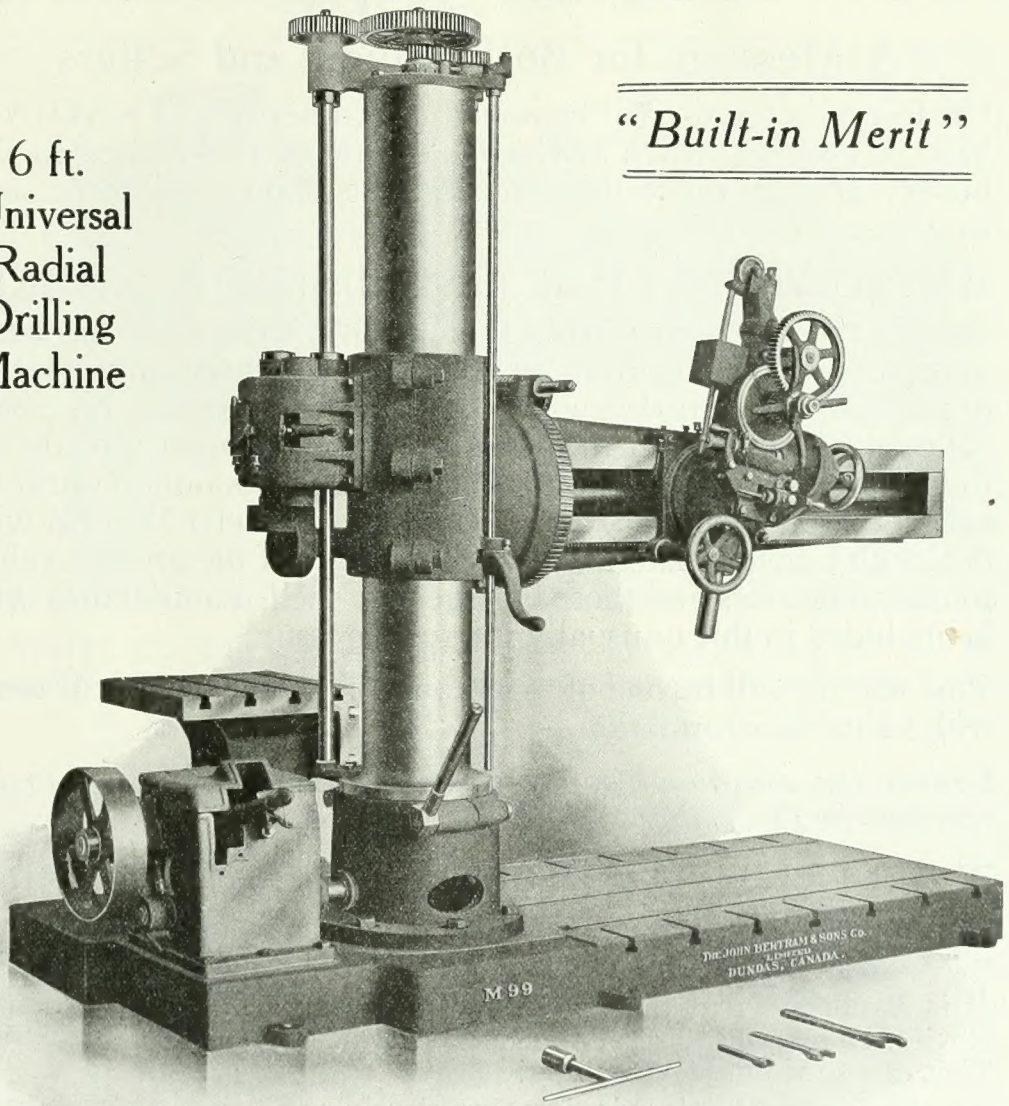
Pratt & Whitney Co. of Canada, Limited

DUNDAS	MONTREAL	WINNIPEG	VANCOUVER
Ontario	723 Drummond Bldg.	1205 McArthur Building	B.C. Equipment Co.

BERTRAM MACHINE TOOLS

"Built-in Merit"

6 ft.
Universal
Radial
Drilling
Machine



DROP US A LINE FOR PHOTOGRAPHS AND FULL DETAILS
on any machine or machines in which you are interested.

The John Bertram & Sons Co.

Limited

Dundas, Ontario, Canada

MONTREAL
723 Drummond Bldg.

VANCOUVER
609 Bank of Ottawa Building

WINNIPEG
1205 McArthur Bldg.

The Publisher's Page

By B.G.N.

Your Annual Opportunity

A Message for Both Buyers and Sellers

On December 30th, will be issued a number of CANADIAN MACHINERY which will be of the utmost importance to the buyers and to the sellers of machine shop equipment and supplies.

ANNUAL REVIEW (and 4th Shell) NUMBER

During the past year CANADIAN MACHINERY has been unusually interesting from an editorial standpoint and a series of successes and surprises will culminate in our coming Number. As the majority of our metal workers are engaged directly or indirectly in the manufacture of munitions, it is only natural to expect that our Annual Review (and fourth Shell) Number will deal with Canada's latest industry. Articles of the greatest value to manufacturers and those engaged in shell manufacture will be included in this unusually interesting issue.

This feature will be one of many and the whole issue will teem with valuable information.

Orders for additional copies of this Number will have to be received by December 21st.

TO MANUFACTURERS AND DEALERS

A sales message in our Annual Review Number will be as safe as any gilt-edged investment, and **will pay larger dividends.**

It is significant that the majority of advertisers in our last Annual Review Number have reserved increased space in our coming issue. That can have but one meaning!

No other paper in Canada is more closely read than CANADIAN MACHINERY. To be in our Annual Review Number is to court fortune with a sunny smile. To overlook your opportunity is to deliberately invite neglect during a most important period of industrial activity and development.

Write, wire or telephone your space reservation at once. Send copy as early as possible, and not later than December 21st.

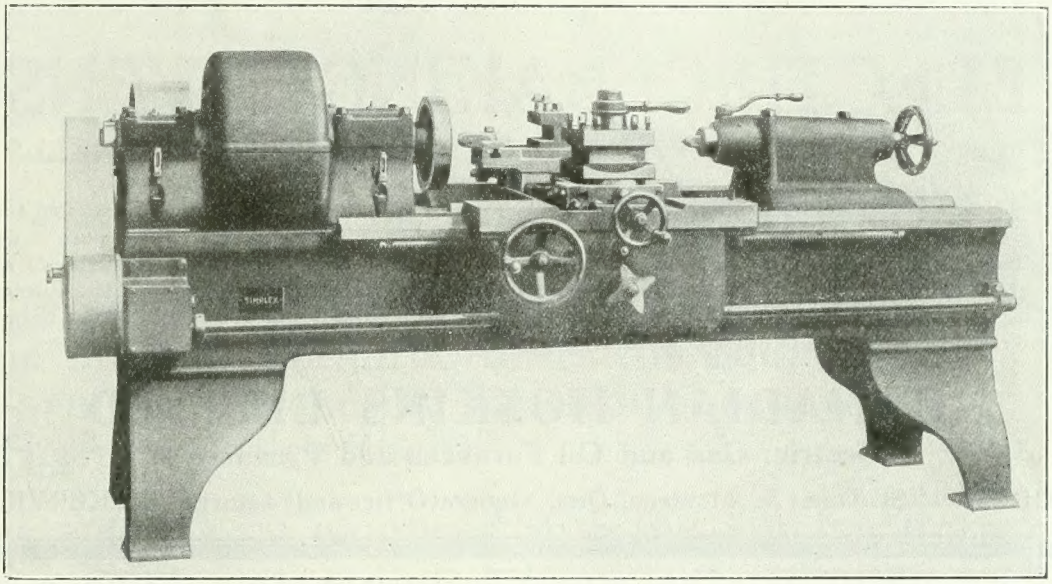
Wise buyers will preserve our Annual Review Number for reference purposes. Wise manufacturers will see that their lines are represented.

CANADIAN MACHINERY
143-153 University Avenue TORONTO

SIMPLEX

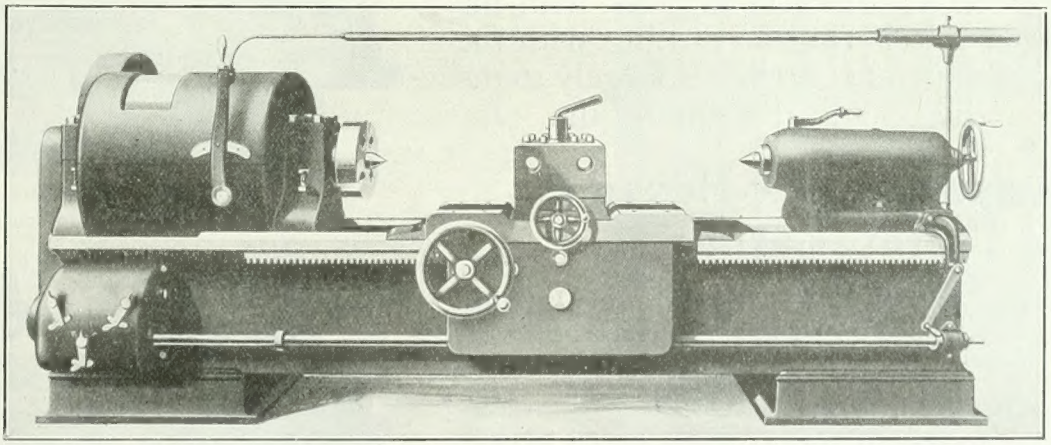
SINGLE PURPOSE HEAVY DUTY GEARED HEAD SINGLE PULLEY DRIVE SHELL LATHES

Illustrating Attachment Assembly for Exterior Operations on Shells.
(Forming Attachment on back of lathe.)



No. 1 SIMPLEX—For 6″ Shells and smaller. Reduced Swing 16″ over Vs—Bed length 8′ or over. Crated weight with above Attachments 4,500 lbs. approx.

Illustrating Attachment Assembly for Interior Operations on Shells.
(Forming Attachment on back of lathe.)



No. 2 SIMPLEX—For Shells of the larger sizes, including 12″. Reduced Swing 26½″ over Vs—Bed length 12′ or over. Crated weight with above Attachments 13,000 lbs. approx.

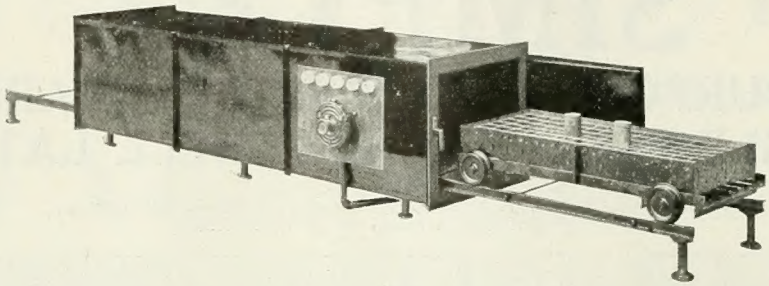
KELLOGG & COMPANY

1204 TRADERS BANK BUILDING **TORONTO, CANADA**

HOSKINS

TRADE MARK REGISTERED

Made in Canada



23 Now in Use in Canada

ELECTRIC BAKING OVENS

FOR BAKING THE VARNISH IN HIGH EXPLOSIVE SHELLS

The electric oven is the most satisfactory for this line of work. The absence of injurious gases and fumes insures protection of the varnish. The electric unit runs almost the full length of the oven, insuring perfect heat distribution. The temperature control is simple, and the temperature of the oven can be properly regulated to within a few degrees. The HOSKINS Electric Oven is built on the same lines as the HOSKINS Electric Furnaces. This efficient construction makes possible the operation of the oven with from 20% to 30% less current than other types of electric ovens. Send for bulletin No. C-106.

CANADIAN HOSKINS LIMITED

Electric, Gas and Oil Furnaces and Pyrometers.

Eastern Office: 112 St. James St., Montreal, Que. General Office and Factory: WALKERVILLE, ONT.

Two Cuts at One Time

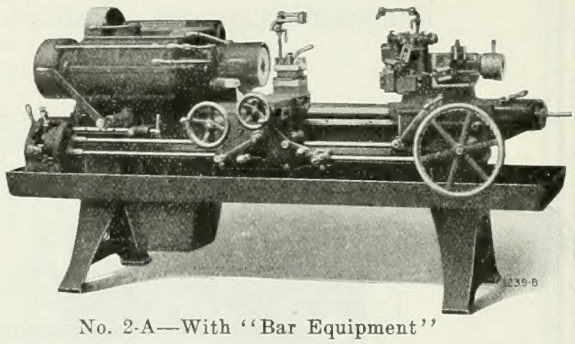
The ability to face, undercut or neck with the square turret while boring or turning with the hollow-hexagon turret contributes largely to the time-saving and economical output of the

Universal Hollow-Hexagon Turret Lathes

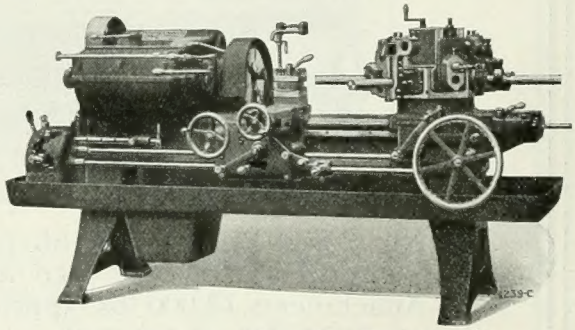
Separate feed shafts, each with ten individual feeds, operate the carriage and turret saddle independently, and provide the exact feed required for each.

And to this great advantage are added the other essentials for rapid and accurate production—excess power, extreme rigidity, great adaptability, and a power rapid traverse that saves time and conserves the energy of the operator.

Without obligation, ask us to show the saving on one of your typical jobs. Send blueprints with rough and finished samples.



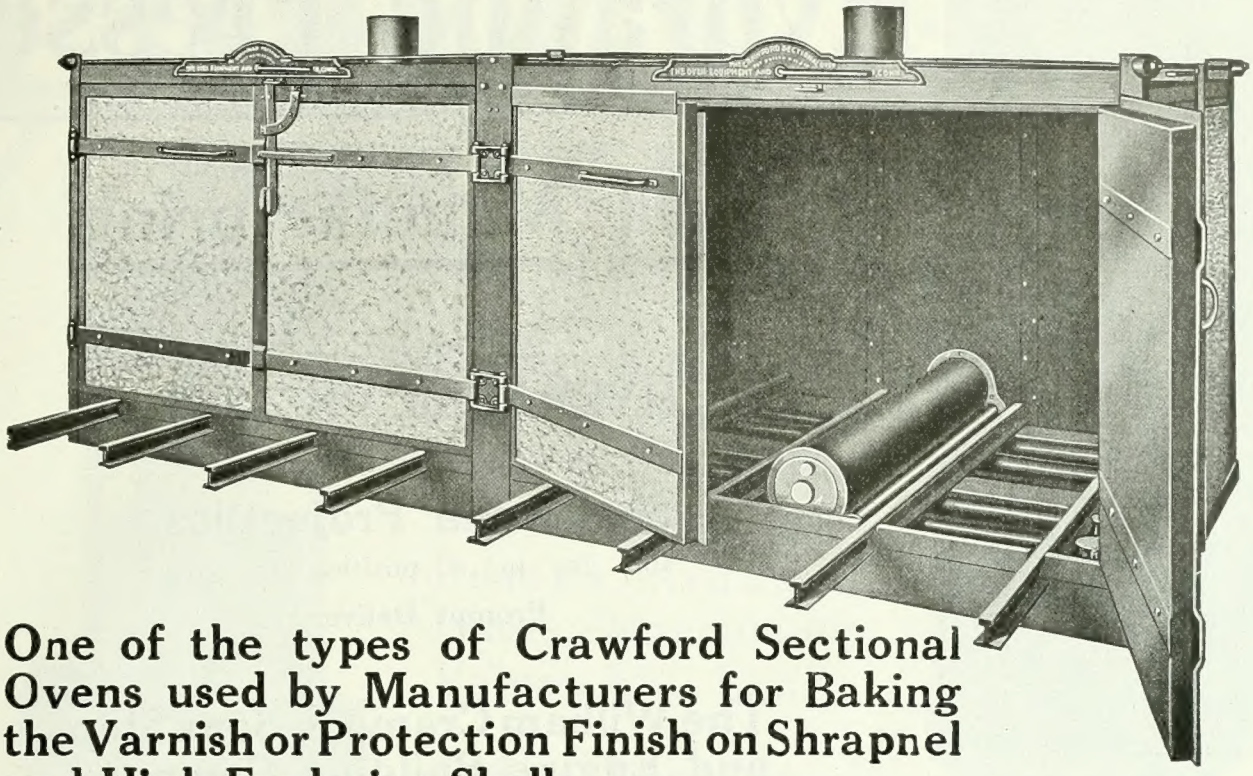
No. 2-A—With "Bar Equipment"



No. 2-A—With "Chucking Equipment"

THE WARNER & SWASEY CO., Cleveland, Ohio, U. S. A.

Canadian Agents: A. R. Williams Machinery Company, St. John, Toronto, Winnipeg, Vancouver; Williams & Wilson, Montreal.

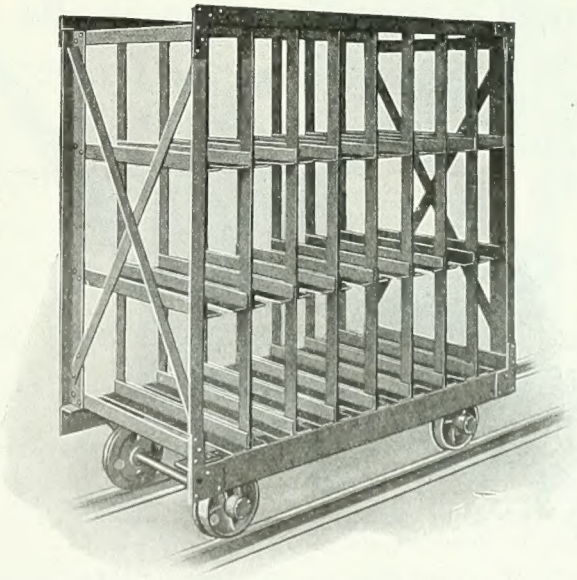


One of the types of Crawford Sectional Ovens used by Manufacturers for Baking the Varnish or Protection Finish on Shrapnel and High Explosive Shells.

These ovens are equipped with the only gas burner that gives a combined radiated heat and circulation of pre-heated air in the oven.

The gas and air are mixed and combustion in the large cylinder supported by air from a positive pressure blower which gives the highest efficiency and economy known for burning either city, natural, gasoline or producer gas, and there is no exposed flame in the oven.

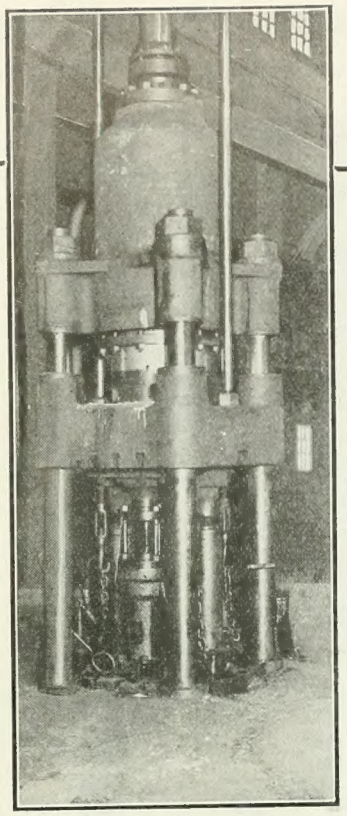
The truck shown holds (120) twenty-eight-pound shells and is planned to stand the shells on end, resting on angles. Other designs have been built for shells ranging in weight from fifteen to eight hundred pounds, the last mentioned shell being forty-eight inches high by twelve inches in diameter.



The Oven Equipment & Manufacturing Company

NEW HAVEN, CONN., U.S.A.

Canadian Representatives: THE A. R. WILLIAMS MACHINERY COMPANY, LIMITED, TORONTO, CANADA



PIERCING PRESS

Hydraulic Presses

for

Shell Manufacturing

We are making

HYDRAULIC PRESSES

for Piercing and Drawing

Shells and Projectiles

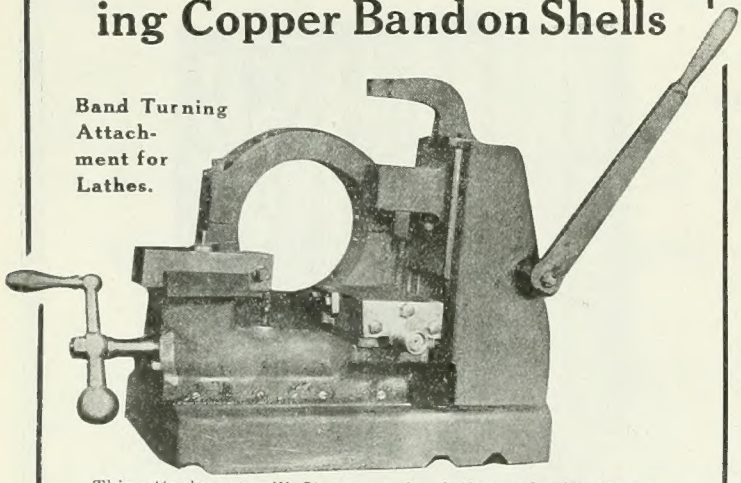
and are in a position to give

Prompt Delivery

The William Cramp & Sons Ship and Engine Building Company

PHILADELPHIA, PA.

A Time-Saver for Turning Copper Band on Shells



Band Turning Attachment for Lathes.

This attachment will fit any engine lathe, and with its use you can turn the copper band on Shrapnel Shells down to size required and burnish them *all in one operation.*

With this device we will guarantee an output of

50 Turned Copper Bands per Hour

Used with a specially constructed steel chuck, casting of which can be finished on the lathe on which the attachment will be used.

Castings are supplied by us.

WRITE FOR PARTICULARS.

LYMBURNER LIMITED

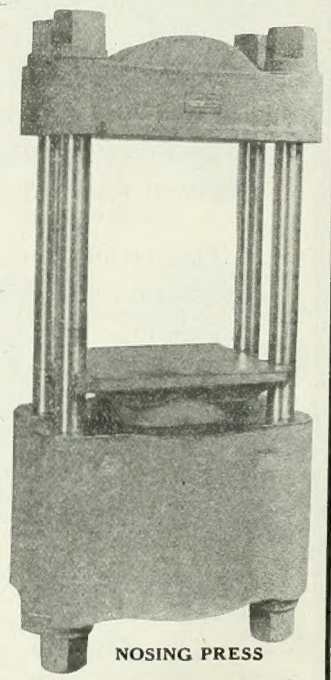
5-15 Commissioners St. Montreal, P. Que.

PRESSES

Pumps and Accumulators

FOR ALL PURPOSES

Made in Canada



NOSING PRESS

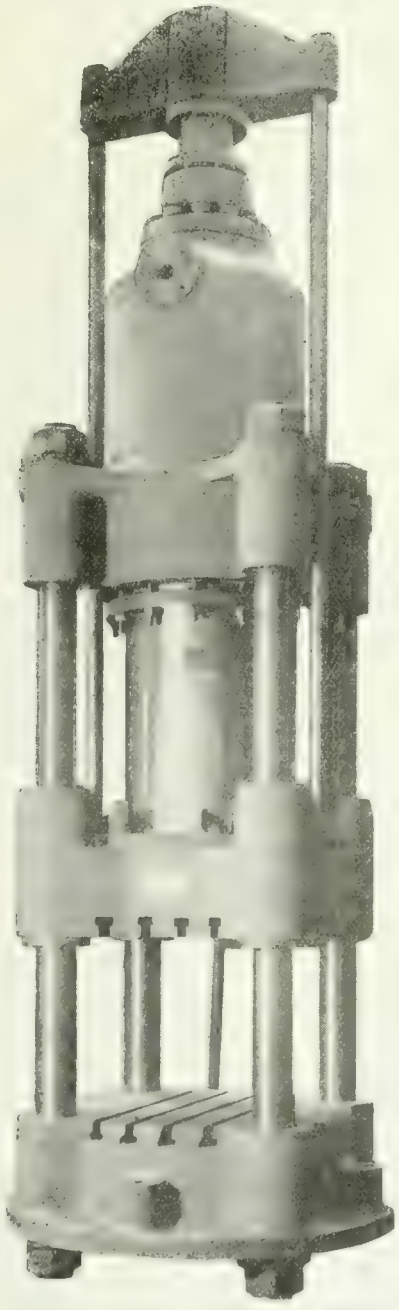
WILLIAM R. PERRIN, Limited

TORONTO

SOUTHWARK

HYDRAULIC MACHINERY

FOR ALL PURPOSES

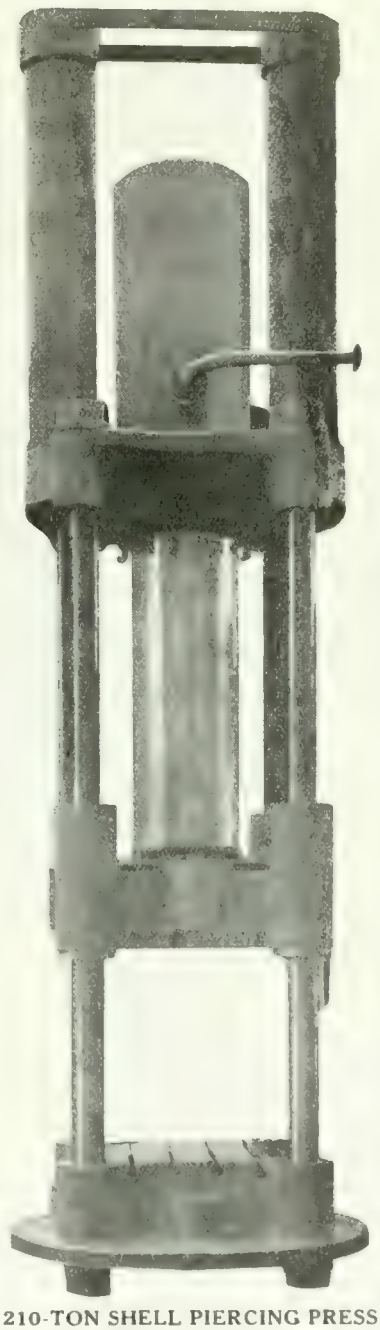


350-TON SHELL PIERCING PRESS

Presses, Jacks, Intensifiers, Riveters, Pipe Fittings, Leather Packings, Cranes, Pumps, Gauges, Hoists, Accumulators, Valves, Etc., Etc.

Other Southwark Products

Centrifugal Pumps, Turbo Generators for Direct or Alternating Current, Turbo Blowers, Surface and Jet Condensers, Southwark-Harris Valveless Oil Engine (for marine and stationary use). Built in sizes up to 1000 B. H. P.



210-TON SHELL PIERCING PRESS

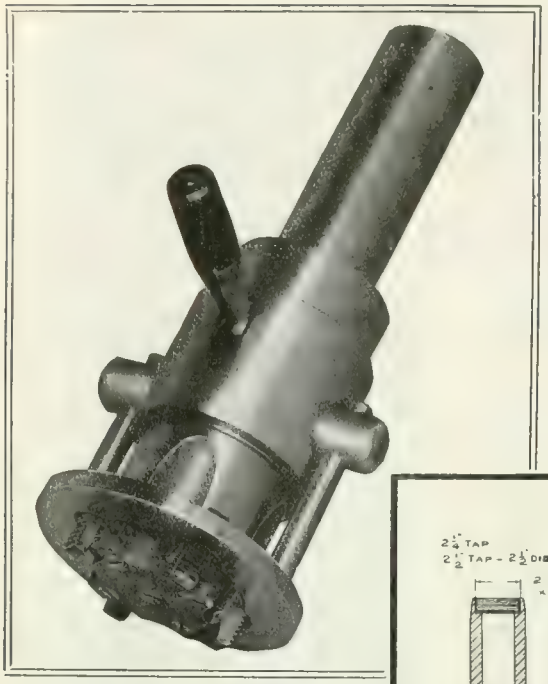
Southwark Foundry & Machine Company

PHILADELPHIA

Founded 1836

Old Colony Building, Chicago — Brown-Marx Building, Birmingham

"First Builders of Large Centrifugal Pumps in America."

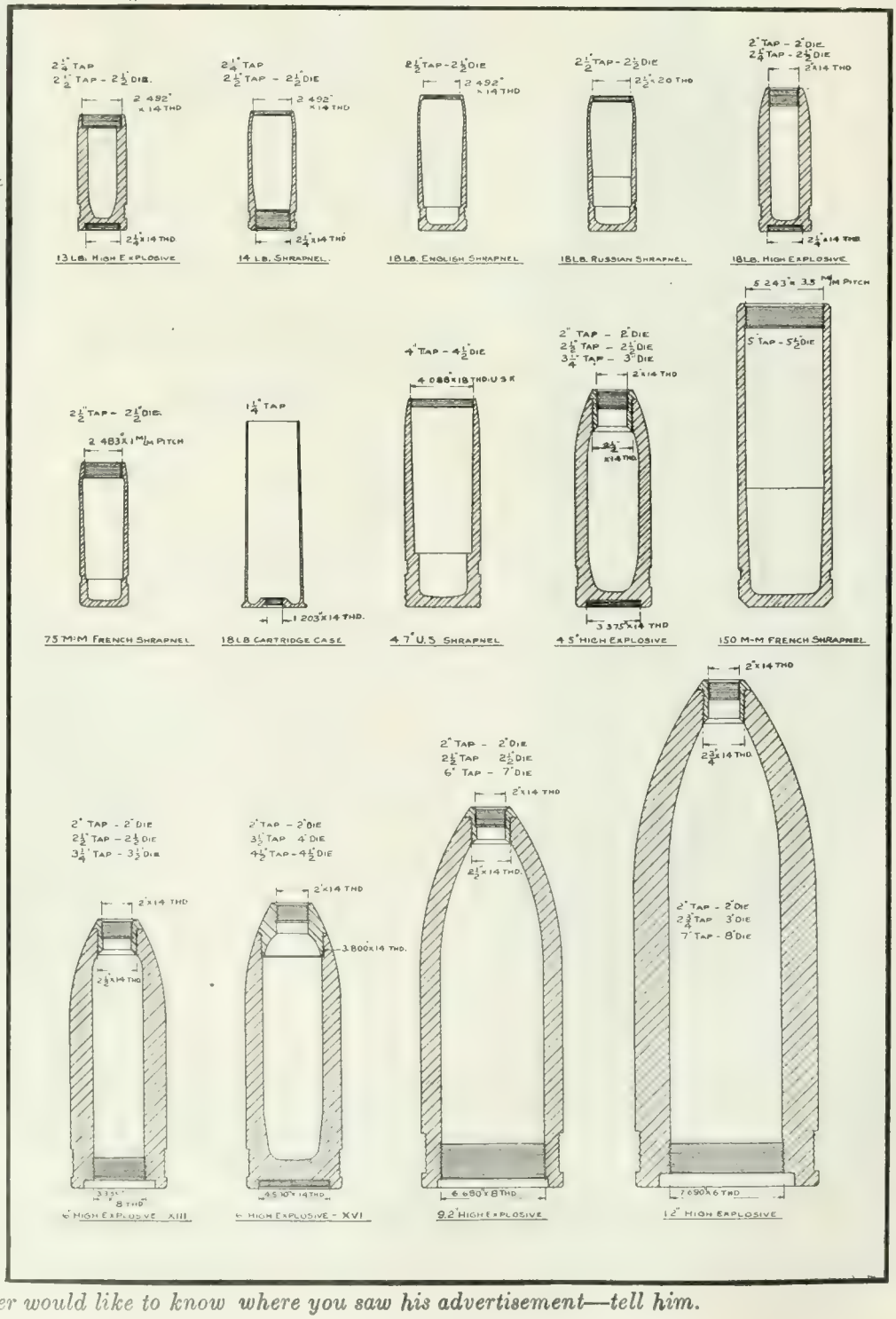


"Murchey" Tools

are threading successfully
all types and sizes of

High Explosive Shells

English, French, Italian,
United States and Russian.



LARGE SHELLS

of 9.2" and 12" diameter

are calling for improved and larger types of Tools to produce them.

Murchey Service

which means Murchey Collapsing Taps and Self-opening Dies — is doing this work NOW in a number of the largest munition plants with entirely satisfactory results.

Send us B-P of your requirements and let us quote you on the necessary tools.

Murchey Machine & Tool Company

75 Porter Street

DETROIT, - MICH.

The advertiser would like to know ***where you saw his advertisement—tell him.***

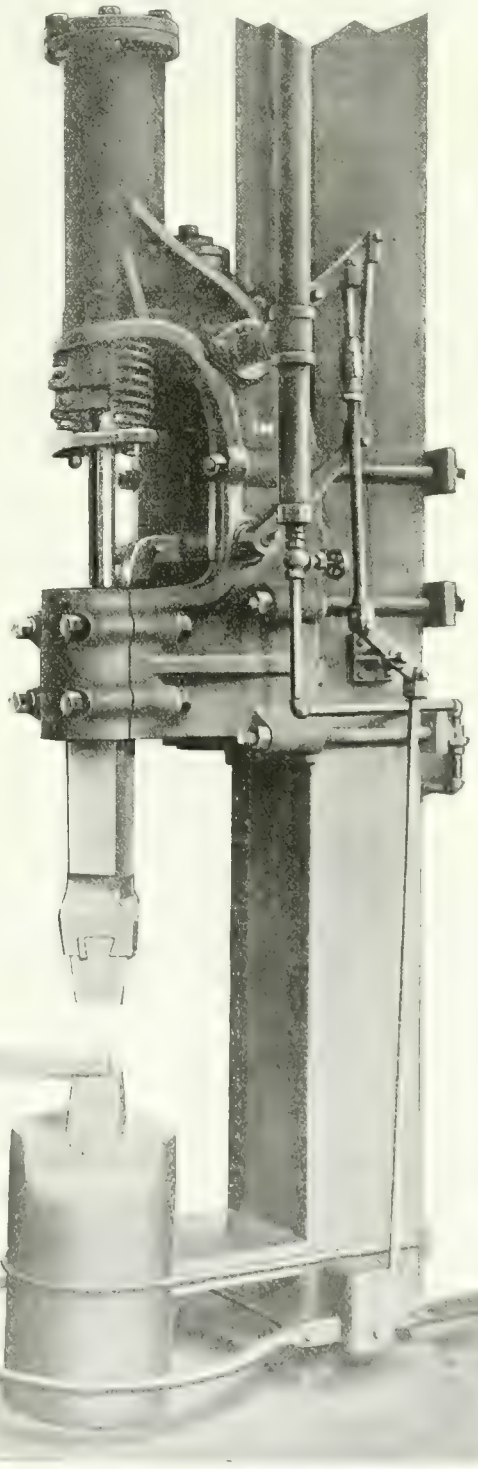
Q M S Post Hammer
"It's All in the Treadle"

Here is the hammer which any shop can afford. It is particularly adapted for all classes of light forging—either drawing, welding or shop work. The Q M S Hammer takes up very little room and can easily be handled by the blacksmith without a helper. Use up the short ends of tool steel by drawing them down for use on the smaller tools. Make the hammer pay for itself by its savings.

The Q M S Post Hammer is suitable for forgings not exceeding 3½ inches square. Can be operated by steam or compressed air and is regularly arranged for bolting to a 12″ x 12″ wooden post. It may be provided with a special attachment for bolting to a structural steel column.

The cylinder is 5″ in diameter, 18″ stroke. Usual die-face 4½″ x 7″. A special valve movement and treadle for handling these hammers makes operation easy and accurate. A slight movement of the treadle causes the ram to rise to the top of its stroke and remain there until released, thereby enabling the operator to adjust work or tools on the lower dies.

We want to tell you more of this hammer and its application to your work. Send for the details.



THE Q M S COMPANY

Sales Agent

VULCAN ENGINEERING SALES CO.

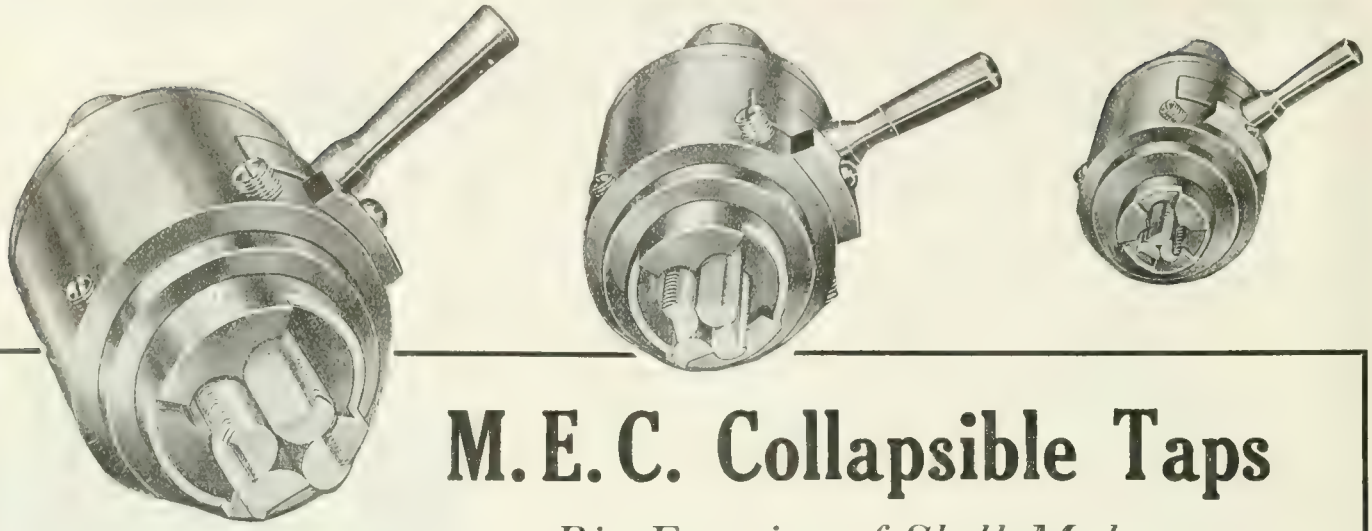
2065 Elston Avenue - - CHICAGO, U. S. A.

Agent for HANNA ENGINEERING WORKS

MUMFORD MOLDING MACHINE CO. J. C. BUSCH CO.

A Q M S Post Hammer in operation at the SAURER plant of the International Motor Co.

If what you want is not advertised in this issue consult the Buyers' Directory at the back.



M.E.C. Collapsible Taps

Big Favorites of Shell Makers

Manufacturers of shrapnel shell parts find them invaluable because of their convenience, rigidity and accuracy.

Many of Canada's largest manufacturers of munitions have adopted them as a **practical way of reducing cost and increasing output,** after putting them to a severe test.

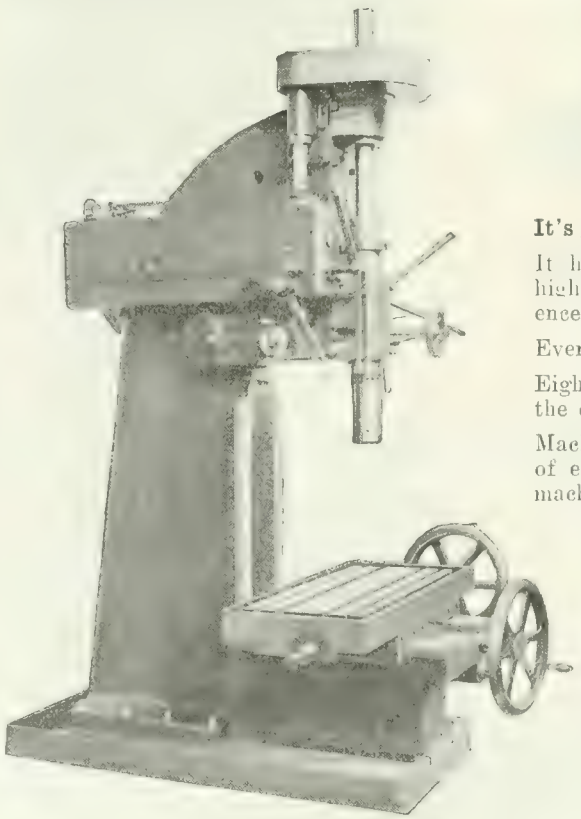
Would you like to hear what users have to say? We'll be glad to put you in touch with our Canadian customers.

Drop us a line now for our proposition—it's a liberal one that's sure to appeal to you.

Manufacturers Equipment Company

175-179 North Jefferson Street, CHICAGO

FOREIGN AGENTS: C. W. Burton Griffiths & Co., Ludgate Square, Ludgate Hill, London, England. Bureaux & Caisse, 39 Rue de Lappe, Paris, France.



IT'S A BAKER

Drilling Shells

It's just the tool for the job, too.

It has the rigidity, accuracy, power and reliability that are highly essential to shell making—it has the speed and convenience that means a maximum production at low labor cost.

Every recent improvement is embodied in its design.

Eight speed and twelve feed changes within easy control of the operator.

Machine shown will drive 5-inch high-speed drills to their limit of efficiency in steel. We also build 2½", 3" and 4" capacity machines.

Put your **drilling, boring, reaming, counter-boring, facing, under-cutting, box-milling and tapping problems up** to a "Baker"—it's a machine for big results.

Drop a line for full specifications.

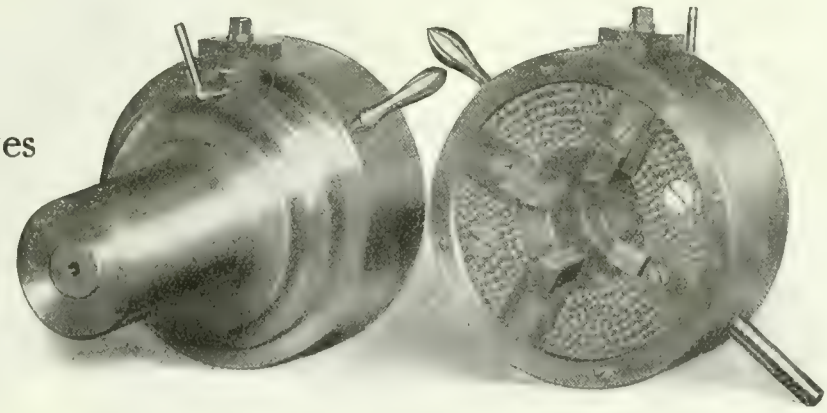
BAKER BROTHERS

TOLEDO, OHIO, U.S.A.

Sales Agents: The A. R. Williams Machinery Company Limited, Toronto, Canada

The "Modern" Speed Die

Eliminates Spoiled Pieces



Self-Opening and Adjustable Die Heads

—SPEED that's invaluable to shell makers

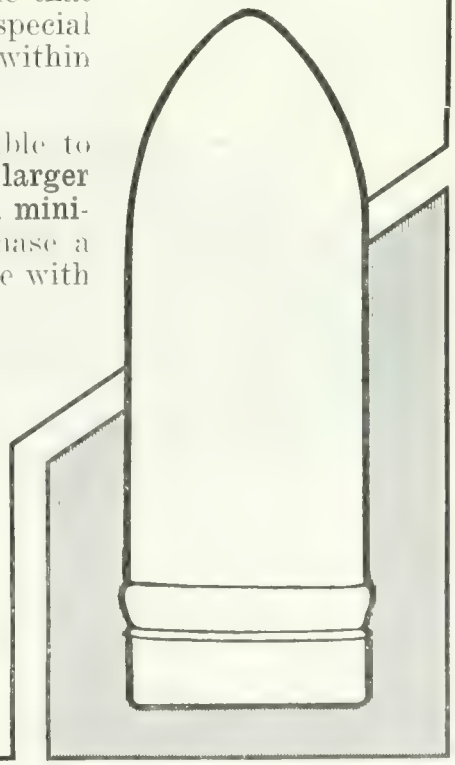
Supported to insure the cutting of a perfectly straight thread, of full size and accurate lead, and the heads will not clog with ships, necessitating frequent cleaning.

All "Modern" Heads now have our cleaning improvement, which permits cleaning without dissembling the head. The chaser clocks, in which the chasers are rigidly held, are firmly supported by a tool steel cam ring.

The "Modern" Die Head is made in a single style that will cut all threads, coarse or fine, of standard or special pitch and pipe threads, of any diameter or length within the capacity of the Die.

No other make of Self-Opening Dies has been able to attain these advantages, hence, if you desire a **larger output of precision work and a wider range, with minimum investment,** you will be compelled to purchase a "Modern" Die Head. So if you are having trouble with your present threading tools you can eliminate this trouble by installing "Modern" Heads.

Information regarding the use of "Modern" Self-Opening Die Heads for threading time fuse parts and base plugs upon request.



Modern Tool Company

Main Office and Works: State and Peach Sts., Erie, Pa.

Canadian Agents. Rudel-Belnap Machinery Co., Toronto and Montrea

Single Purpose Lathes for Shell Work

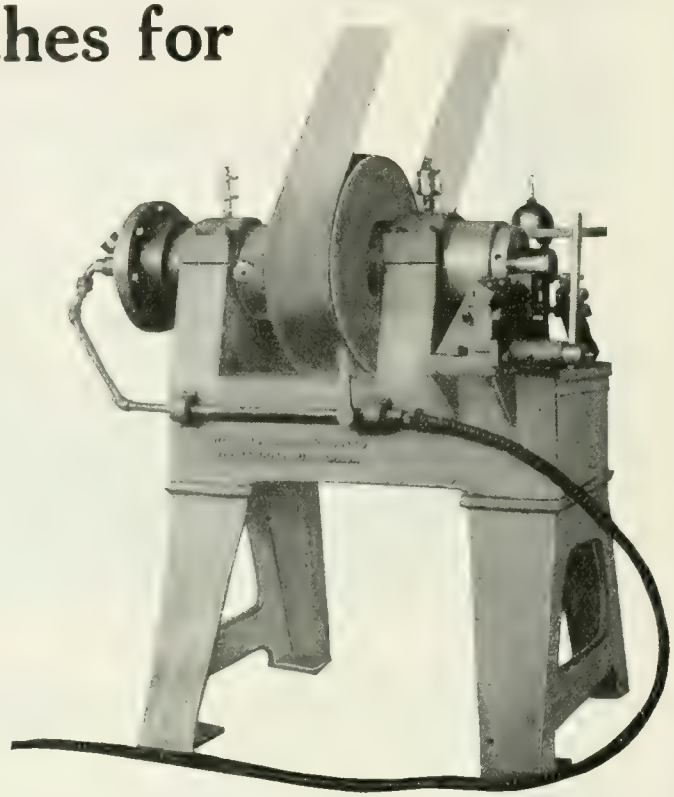
The Lathe as shown is equipped with air chuck and friction, and tooled for the Russian High Explosive Shell.

We can make quick delivery on these single purpose lathes for band turning operation on British sizes, 18 Pr., 4.5, 5″, 6″, 8″, 9.2″. These machines are also tooled when required for the M/M sizes corresponding for Russian and French ammunition. The machine as illustrated will truly and accurately finish 50 to 60 bands per hour. For particulars write

The Jenckes Machine Co., Limited

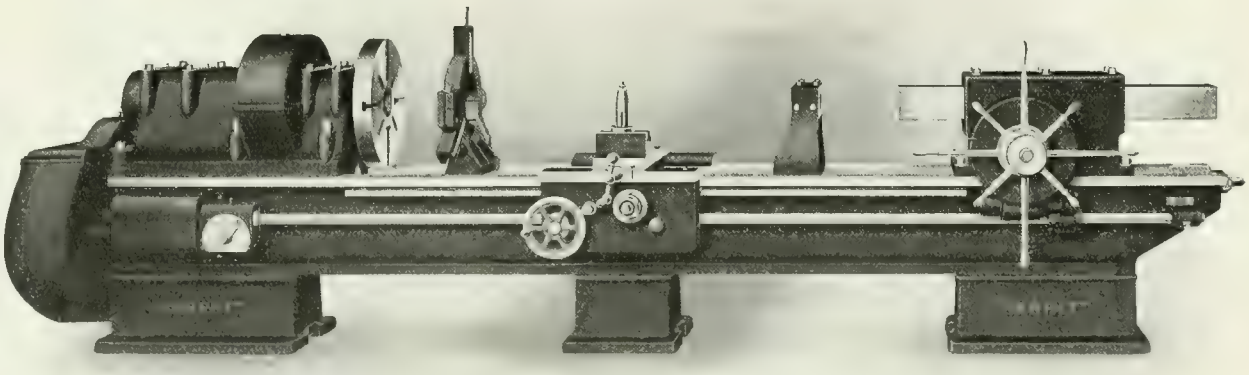
Sherbrooke, Province of Quebec, Canada

SALES OFFICES: Montreal, Toronto, St. Catharines, Vancouver. AGENCIES. London, England, E. J. Bartlett, Savoy Hotel. Paris France, Can. & Am. Continental Agency, 126 Rue de Beaume.



Single Purpose Lathe, air equipped for turning and finishing the driving band on Shrapnel and High Explosive Shells, British, French or Russian.

Barrett 25" Heavy Duty Projectile Boring Lathe

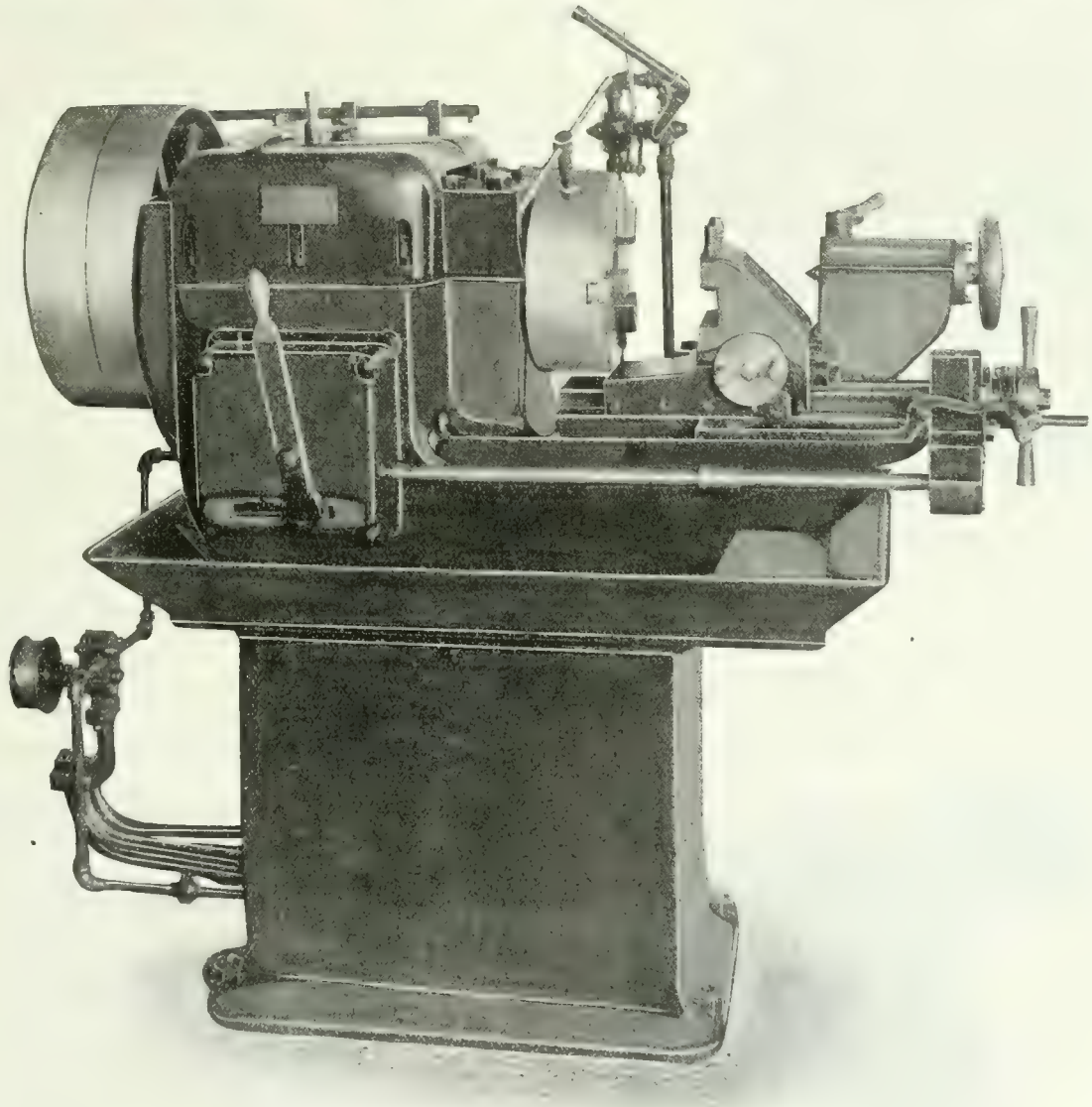


A thorough tried-out proposition for boring and facing projectiles and shells up to 12 inches.

LET US SEND YOU SPECIFICATIONS AND FULL PARTICULARS.

Barrett Machine Tool Co., Meadville, Pa., U.S.A.

Shell Manufacturers'
SINGLE PURPOSE LATHES



This cut illustrates one of a group of machines furnished a manufacturer for Band Grooving, Wave Thread and Undercutting in one operation.

This machine is designed for Trimming, Facing base, Finish turning body nose, Band Turning, Rough Turning body, Band Grooving, Wave Thread and Undercutting, etc., etc.

The object of the design included the following points which we believe have been successfully achieved:

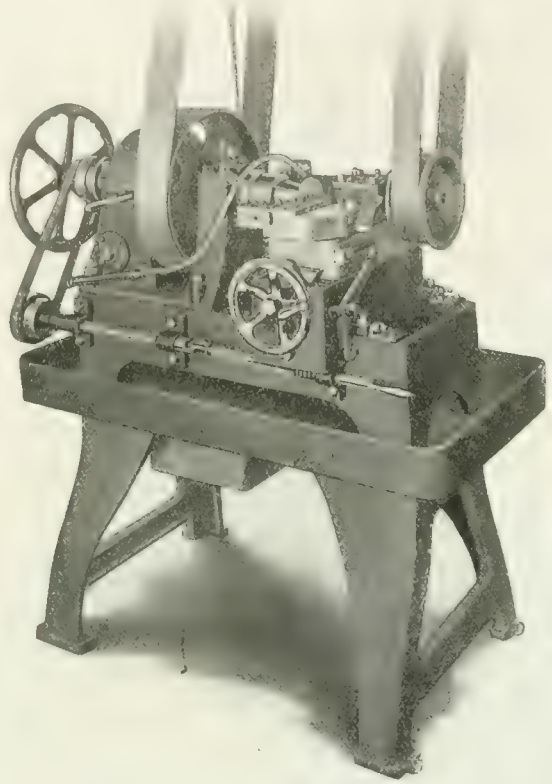
First—The use of unskilled labor.
Second—Reduction of tooling expense by simplifying equipment.
Third—Economy of floor and ceiling space.
Fourth—Minimum installation cost, no countershaft to erect and belt.
Fifth—The relief of expensive turret lathes from operations for which they were not particularly adapted and at the same time simplify their work, allowing the use of unskilled labor.

Machines can be equipped for any outside operation on shells.

Write for prices and details, specifying operation for which machine is required.

The General Supply Company of Canada, Limited

356 Sparks St., OTTAWA, ONT.
125 Adelaide St. W., TORONTO, ONT.
408 McGill Building MONTREAL, QUE.
85 Water St., WINNIPEG, MAN.



For Turning, Facing and Milling the Thread on Gas Check Plugs for 18 pr., 4.5" and 60 pr. High Explosive Shells

THE BANFIELD PLUG MILLER

THIS machine is especially designed for finishing base plugs, turning the outside diameter, finishing the face with any camber desired, and milling the thread, all in one chucking, the complete plug being finished in three minutes by unskilled labor.

The machine is equipped with quick draw in collet. Drive pulley 16" x 4", with bronze bush having cut jaw clutch for turning and facing. Bronze worm gear 74 to 1 ratio, with cut jaw clutch for milling, driven by 10" x 1½" flanged pulley. The milling cutter is driven by an 8" x 2½" flanged pulley. Tool post carriage is equipped with power feed (two speeds) having automatic stop. Power feed pump with relief valve driven from worm shaft (*all drives direct from main line shaft*). Rigidly built, simple and economical to operate.

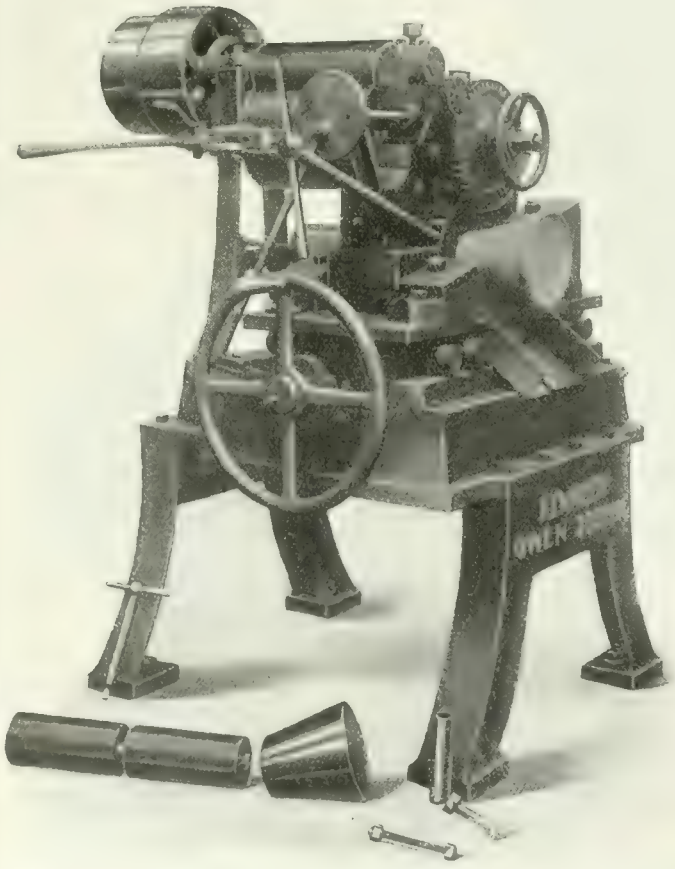
For 6" High Explosive Shells, can furnish larger and heavier machine of the same type. Particulars on request.

Write for prices and deliveries.

BUILT EXCLUSIVELY BY

Edwin J. Banfield

STAIR BUILDING TORONTO, ONTARIO



CUTTING-OFF MACHINES

Quick Delivery

For cutting off and trimming 4.5" to 9.2" Shell Blanks and Forgings.

Two cuts at once. Intelligent laborer can operate.

Floor space approximately 4 feet square.

Will cut crooked and short ingots. No loose collars to put on billets.

1 Helper to every 3 or 4 machines.

Selling Agents:
THE W. W. BUTLER CO., Limited
Transportation Bldg., Montreal

THE
Wm. Kennedy & Sons
LIMITED
OWEN SOUND

The advertiser would like to know where you saw his advertisement—tell him.

SHELL EQUIPMENT

Hydraulic Presses. Accumulators and pumps for piercing and drawing blanks. Any size.

Lathes. Standard Engine, Turret, Single Purpose with attachments.

Thread Chasers for Sockets, Plugs and Gaines.

Drills. Duplex and Single.

Cutting-Off Machines.

WRITE FOR PRICES AND DELIVERIES

GARLOCK—MACHINERY

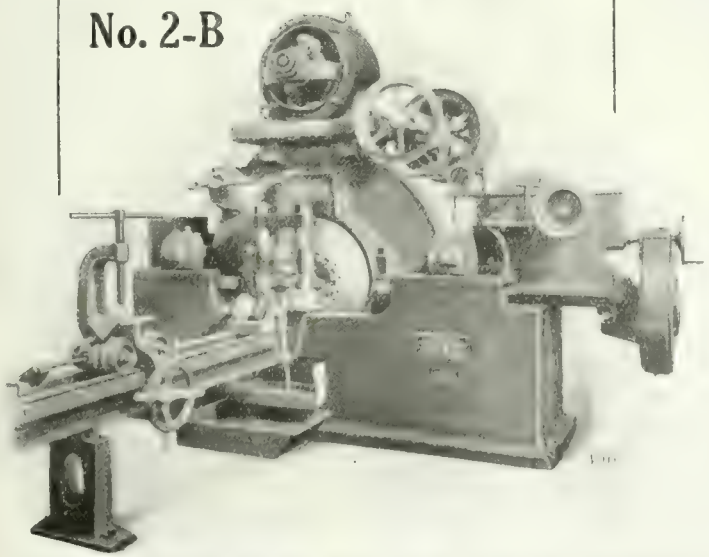
197 WELLESLEY STREET, TORONTO

Telephone, North 6849

IMMEDIATE DELIVERY

Gorton Heavy Duty Cutting-Off Machine

No. 2-B



FRONT VIEW GORTON NO. 2-B HEAVY DUTY CUTTING OFF MACHINE - Capacity 6 inch Rounds or Less, 5 inch Squares or Less. Photo Shows Standard Equipment 20 H.P. 2.1 Variable Speed Motor, as Motor is preferably connected with 5" endless belt with provision for taking out slack. Any Make Motor may be quickly installed by the Purchaser.

Net Weight Complete as Shown but without Motor, 18,000 Pounds.

Code Word, Complete as Shown But Without Motor Kreuzlinger. (Special Catalog on request.)

We can make prompt delivery of 6" machine, as shown. It is a type of machine which originated with this company, and has been very carefully developed for ten years past, and is used by all of the large steel works and by other manufacturers in the United States.

This is the only machine for shell and shrapnel work. We have furnished twelve to one large firm and several to each of a number of other firms.

3½" Round Shrapnel stock, when cutting bars singly, may be severed at the rate of 600 cuts per 12 hours. Arranged with special jaws to cut two bars at a time 800 to 1100 cuts can be made per 12 hours.

6" ordinary round steel may be cut at the rate of over 300 cuts per ten hours.

We also make a 15" machine which has a great record.

George Gorton Machine Company

Manufacturers of Engraving Machines and Heavy Duty Cutting-off Machines

RACINE, WIS., U.S.A.

Cable Address: "Gorton, Racine." Use A.B.C. Code (4th edition) or Western Union Code (Universal edition)

2½ Million Bought

The mechanical advantages of AMERICAN Steel-Split PULLEYS, and the pulley service that they make possible, have caused pulley users to buy over 2½ million. More AMERICAN Pulleys are bought than of any other one make.

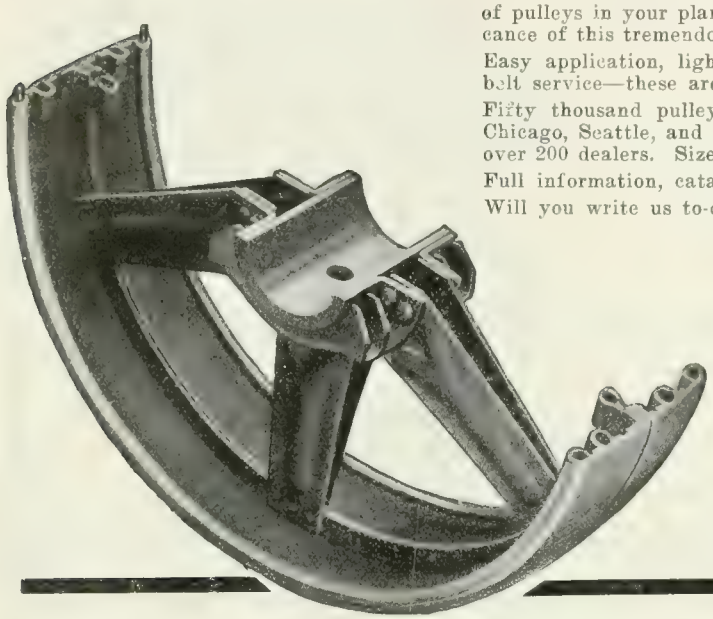
Just consider for a minute the confidence that this reflects. Estimate the number of pulleys in your plant that might be steel split, and then you'll get the significance of this tremendous output.

Easy application, light weight, minimum air fanning, unusual strength, double belt service—these are some of their characteristics.

Fifty thousand pulleys stocked for immediate delivery at New York, Boston, Chicago, Seattle, and at the factory, besides thousands of others in the stores of over 200 dealers. Sizes 3" to 120".

Full information, catalogs and prices will be sent promptly on request.

Will you write us to-day?



AMERICAN PULLEY COMPANY
4206-60 Wissahickon Ave., Philadelphia, U. S. A.

NEW YORK 33-35 Greene St. | BOSTON 165 Pearl St. | CHICAGO 124 South Clinton St. | SEATTLE 536 First Avenue, South

WILLIAMS & WILSON, LTD., Montreal

THE A. R. WILLIAMS MACHINERY CO., LTD.
St. John, N. B. Toronto Winnipeg Vancouver

AMERICAN
STEEL SPLIT PULLEY

The advertiser would like to know where you saw his advertisement—tell him.

To the Shell Manufacturer:

Use

Economic Shell Washer

If you wish to wash your shells quickly and cheaply; it will remove all grease, oil, lead, etc., and makes the shells easy to lacquer.

Made in Canada by

Canadian Economic Lubricant Company, Limited, Montreal

SPEED SPEED

This pile of 1-inch square steel bars was cut in nine hours with a

Racine Metal Cutter

with ONE BLADE at a blade expense of six cents.

You will profit by learning all about the Racine features that make records like this possible.

Used extensively in Canadian plants. One Canadian Steel Company is using 120.

We'll gladly put you in touch with users and send full details.

RACINE TOOL & MACHINE COMPANY
15 Melbourne Ave., Racine, Wisconsin, U.S.A.

ONE MAN can do as much trucking with this

ELEVATING TRUCK

as several men with several ordinary trucks

IT EFFECTS ENORMOUS SAVINGS IN TIME AND LABOR IN HANDLING SHELLS OR ANY OTHER FACTORY PRODUCT WHERE NUMEROUS OPERATIONS ARE REQUIRED.

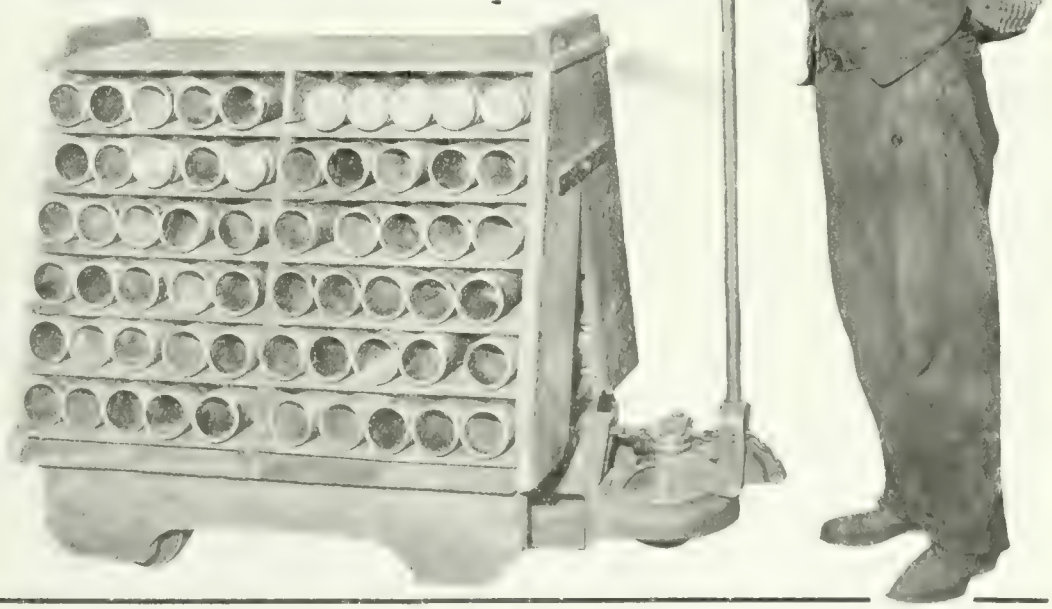
All material is stacked on the platforms. To move material the truck is backed under the platform; the handle of the truck is then pushed down, keeping the button depressed, which raises the truck bed and with it the loaded platform, at the same time automatically locking it in its raised position. When hauled to the desired position the button is pressed and the handle is raised, lowering the platform to the floor. The truck is then drawn from underneath and is ready to move another platform.

Raising and lowering of the Truck can be operated with one hand only

—can be raised or lowered at any angle.

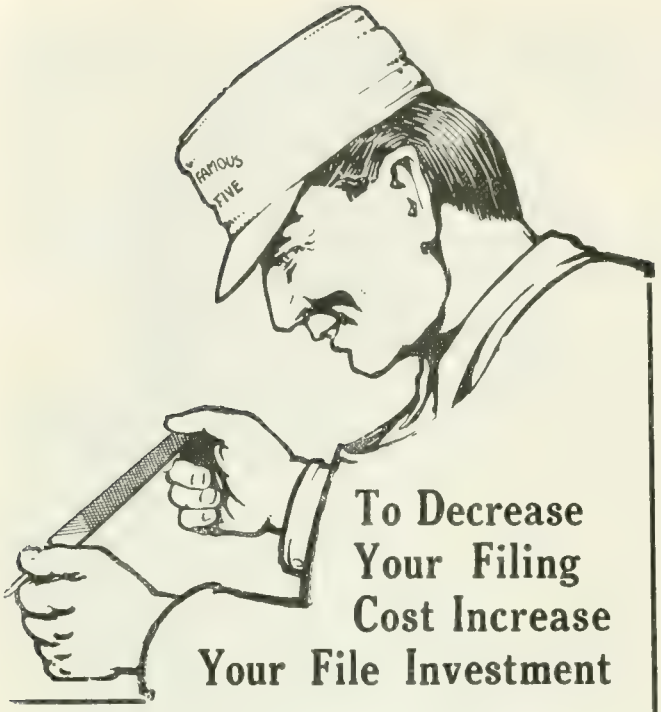
We also manufacture **Loading Funnels, Ball-Bearing Tightening Nuts, Belt Driven Loading Vibrators, Bench Vises and Presses with attachments for pressing** in band — fixtures especially adapted for the manufacture of 18 pr. Shrapnel Shells.

We shall be pleased to submit prices and give any particulars required.



The Chapman Double Ball Bearing Co.
of Canada, Limited
339-351 Sorauren Ave., Toronto, Canada

TRANSMISSION BALL BEARING COMPANY, INC.
1407 West Ave., Buffalo, N.Y.



To Decrease Your Filing Cost Increase Your File Investment

A file when it is half worn takes more time to do a certain piece of work than a new file.

Therefore when your files reach the "inefficient" point, they should be properly discarded and replaced with new ones.

Preferably with

KEARNEY & FOOT
GREAT WESTERN
AMERICAN
ARCADE
GLOBE

(*Made in Canada*)

The cost of a new file more than pays for the saving in time and labor.

And with new files your workmen do cleaner, better work.

Our 50 years' experience in the making of the above brands guarantees their efficiency.

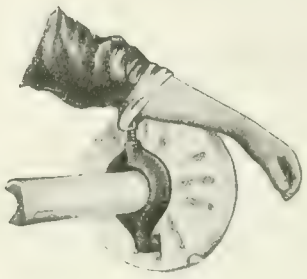
An output of 60,000,000 yearly proves their popularity.

A FREE copy of "File Filosophy" will be sent you on receipt of a card.

Nicholson File Company

Port Hope (*Dealers Everywhere*) Ontario

You Can Prevent This Accident If You Will.



At a small comparative cost for

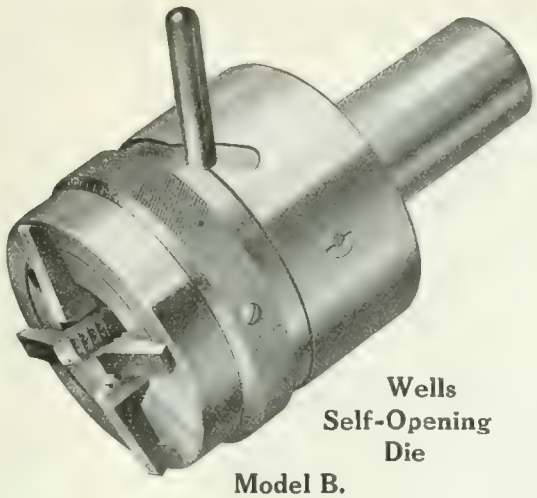
Williams' "VULCAN" 100% Safety Lathe Dogs

You buy the best insurance from your dealer.

J. H. WILLIAMS & CO.
45 Richards Street BROOKLYN, N.Y. CITY
The Wrench People

Western Office and Warehouse:
40 So. Clinton Street
CHICAGO, ILL.

Send For Catalogue.



Wells
Self-Opening
Die
Model B.

We want to send you the booklet describing the different models. Are you willing to try the W.S.O.D. in your shop under your own conditions?

W. S. O. D.

We call it the "universal die" because there is not a screw-cutting machine manufactured on which it will not fit.

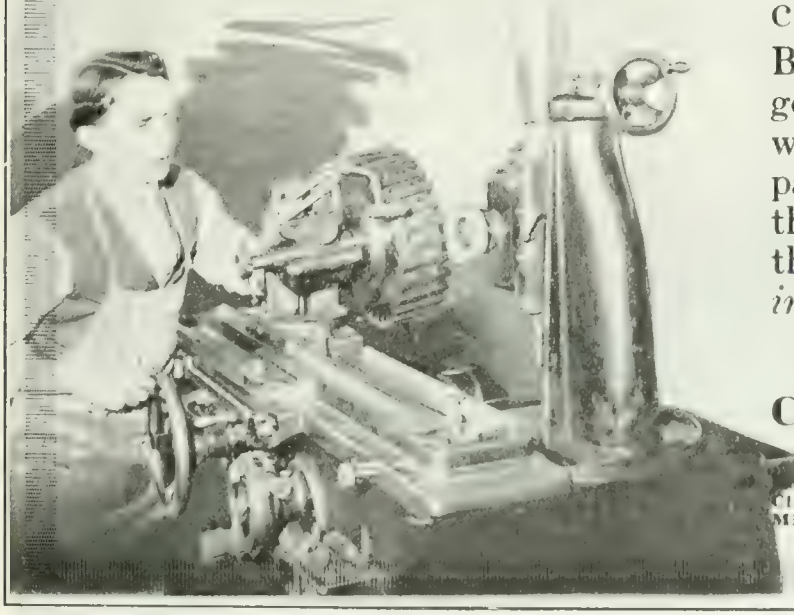
Its very appearance attracts and holds you—you instinctively know it will do the work—and it will.

It is the simplest and most efficient of all automatic opening die heads.

WELLS BROTHERS COMPANY OF CANADA, Limited
GALT · ONTARIO

Sales Agents:
The Canadian Fairbanks-Morse Company, Limited, Montreal, Toronto, Vancouver, Winnipeg, St. John, Calgary.

For Example, Take the Work of Grinding Cutters

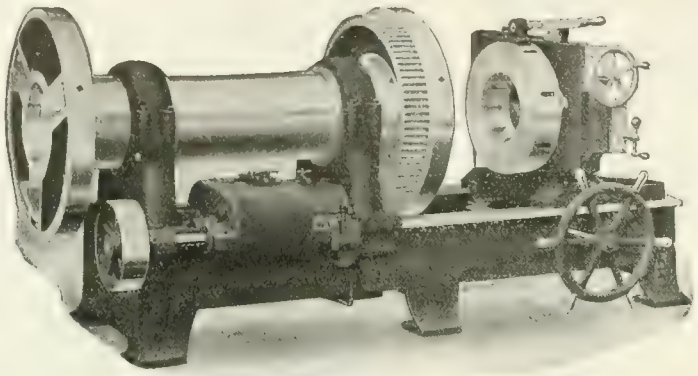


It calls for a wheel that will cut clean and fast and positively cool—a wheel that will hold its shape so as to insure accuracy.

Be certain, therefore, that you get an Aloxite wheel—the wheel for steel. Our service department will see to it that the grit and grade are right—that you get *the Right Wheel in the Right Place.*

The Carborundum Company
Niagara Falls, N. Y.

...ston New York Philadelphia Pittsburgh
Cleveland Cincinnati Grand Rapids Chicago
Milwaukee Manchester, Eng. Reisholz, Ger.



THE RATE OF DEPRECIATION

This rate is low in the B. & K. Pipe Machines, because the construction is of the most substantial character. There is nothing more discouraging than to have a machine start off well, and then fail and go to pieces. The die-head, chucks, gear-box and oiling system are all equally well designed and constructed, making the whole a most dependable, no-weak-link pipe machine.

Three styles and nine sizes to choose from.

CATALOG ?

Bignall & Keeler Machine Works, **Edwardsville, Ill.**

The Canadian Fairbanks-Morse Co., Ltd.

Sales Agents for Canada

Montreal St. John Toronto Winnipeg Calgary Saskatoon Vancouver

Canada's Departmental House for Mechanical Goods

When you figure production time in seconds as it is figured in the grinding room shown in the illustration, your search for a satisfactory grinding wheel is almost certain to end in the selection of

NORTON GRINDING WHEELS

We are constantly making Norton Alundum and Crystolon wheels more efficient for particular grinding operations. Greater production— better finish— lower costs— whatever your problem may be, our experience will help you.

The reputation of Norton wheels is the measure of our success.

NORTON COMPANY

WORCESTER, MASS., U.S.A.

Canadian Agents: The Canadian Fairbanks-Morse Co., Limited, Montreal, Toronto, Ottawa, St. John, N.B.; Winnipeg, Calgary, Saskatoon, Vancouver, Victoria. **F. H. Andrews & Son,** Quebec, P.Q. 711

Finishing Armature Shafts Is a Norton Grinding Machine Job

The work must be accurate, and competition in the electrical field eliminates anything but the most efficient methods.

For these reasons this company has 20 Norton Grinding Machines working as Norton machines should work—as stock removing machines.

The armatures are rough turned on the lathe and are turned over to these machines with about 1-32″ of stock still to be removed.

Let us show you how a Norton Grinding Machine, working the Norton Way, will help you increase production per hour.

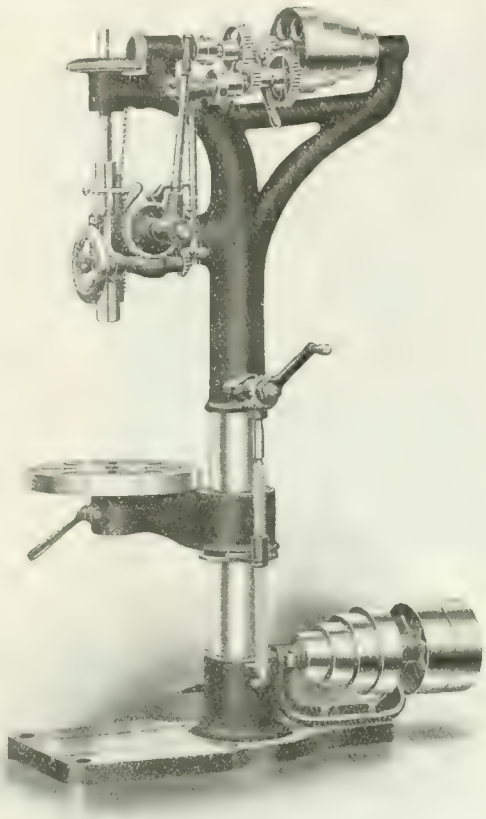
Norton Grinding Company

Worcester, Mass.

Canadian Agents :

THE CANADIAN FAIRBANKS-MORSE CO., Montreal, Que.; Toronto, Ont.; Vancouver, B.C.

N 425



A General Purpose 20" Drill Press

This is a very valuable machine for manufacturing, as it is adapted to a large variety of work; and with the Power Feed and Automatic Stop, with proper jigs, they are run in gangs of from 2 to 6 or more, greatly facilitating and reducing the cost of getting out work.

This Drill has features in the manner of changing from lever to wheel feed that are very quick and effective. By a slight turn of the lever a clutch is thrown from lever to wheel feed, and each is independent of the other when in use.

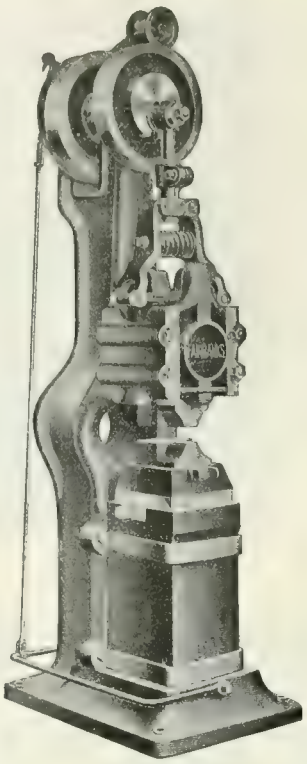
Full specifications on request

The Canadian Fairbanks - Morse Company, Limited

CFM

St. John Montreal
Quebec Ottawa
Toronto Hamilton
Winnipeg Saskatoon
Calgary Edmonton
Vancouver Victoria

CANADA'S DEPARTMENTAL HOUSE FOR MECHANICAL GOODS



Forge Your High-Speed Steel on a Fairbanks Power Hammer

An ideal hammer for this class of work. By the use of a steel spiral spring, the force and weight of the blow is greatly increased without any danger of breakage. This spring also acts as a cushion, relieving the machine of all jar. The head strikes a quick, sharp blow and instantly gets away from the work without chilling the stock.

Made in many sizes with rams from 25 lbs. to 250 lbs.

Write now for full information.

Prices gladly quoted on receipt of specifications.

The Canadian Fairbanks - Morse Company, Limited

CFM

St. John Montreal
Quebec Ottawa
Toronto Hamilton
Winnipeg Saskatoon
Calgary Edmonton
Vancouver Victoria

CANADA'S DEPARTMENTAL HOUSE FOR MECHANICAL GOODS

Large Shells : Production Problems and Possibilities---V.

By C. T. D.

In preparing to undertake the production of large shells up to 9.2 in. dia., manufacturers will encounter problems of a nature altogether different from those connected with 18 pdr. shells. Automatic machinery will not be so applicable to the larger sizes, and productive ability will centre largely on such points as sequence of operations, tooling methods, etc.

ALTHOUGH the majority of manufacturers who have undertaken the production of large shells are already operating plants of more or less magnitude, they are more than likely to find that a considerable number of new machines will be necessary in order to maintain deliveries. Those firms who are already established, especially in lines of a general nature, will lean towards the adoption of machines which possess features and quality of more than temporary interest. The increased industrial activity which is ultimately expected justifies the selection of machine tools which can be expected to continue rendering good service for years to come.

Machines of this class have been produced by several makers during past years, which, although primarily adapted to munitions manufacture, are of considerable value as producers in establishments of the class referred to.

The installation of such machines at the present moment, while initially more costly, is ultimately a double economy, because, firstly, they are the result of many years' experience by large organizations, who have made a success of work of this kind. They have been tested out under months and years of severe service, consequently their makers can supply them with the assurance of immediate production without that experimenting which has so frequently to be done when one is operating along new lines. Secondly, when their work on war material is finished, their sound design and first-class construction give them a high permanent market value, whether they are retained in a factory or offered for sale.

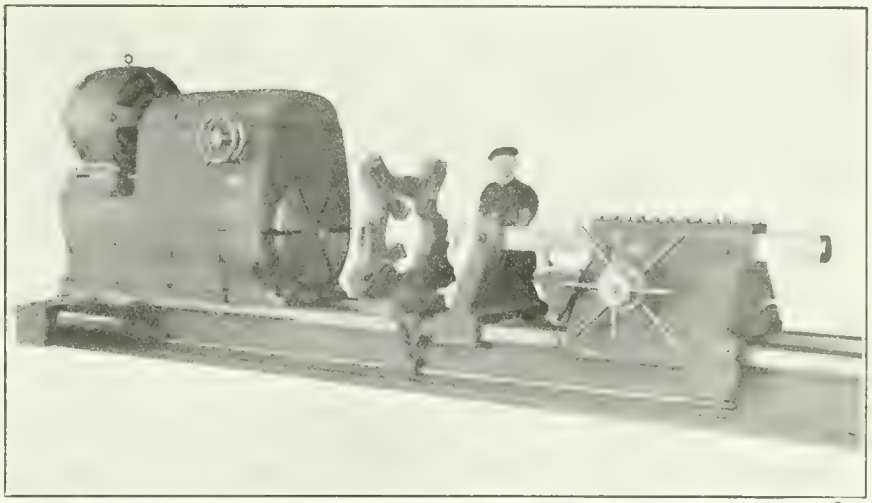


FIG. 15 PROJECTILE BORING LATHE FOR SHELLS FROM 6 IN. TO 12 IN. DIA.

For many years the John Bertram & Sons Co., of Dundas, Ont., have specialized in the building of machine tools of the highest grade for many lines of engineering work, and their activity in providing equipment for munitions plants has been characterized by all the features of their normal efforts.

The accompanying schedule of operations suggested by them is based on use of machines which have been developed specially for large projectile work, yet have that value for other lines which appeals to the fore-armed manufacturer. Minor operations are performed on existing types of machines which call for no special comment.

Comparing these operations with previous suggestions, the principal feature observed is the thoroughness of the methods adopted. For instance, when finish turning the body in the fifth operation, the shell is mounted on a special arbor which extends through the nose, thus insuring absolute concentricity between inner and outer surfaces. While the careful performance of previously published methods on miscellaneous machines would produce work of the required accuracy, the absolute certainty of these methods ultimately results in greater output.

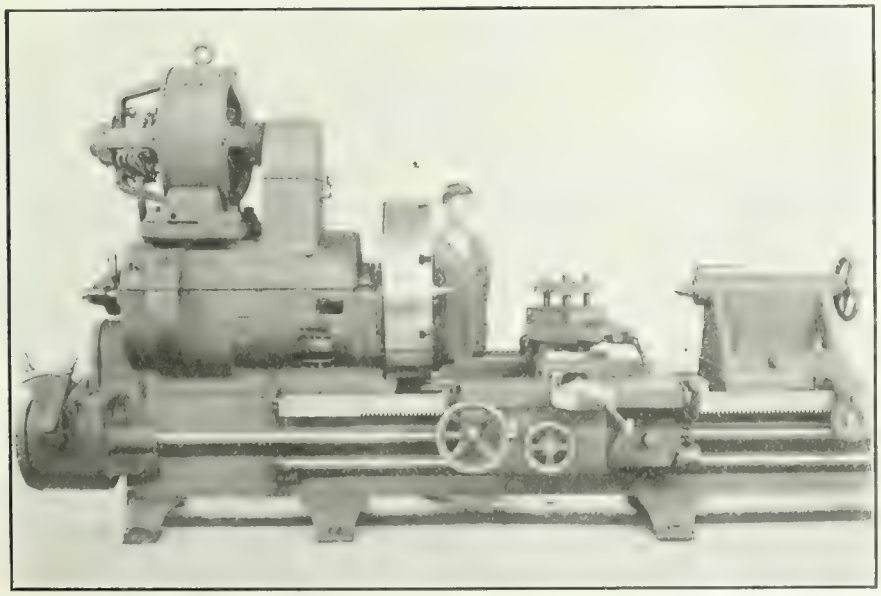


FIG. 14. 36 IN. MOTOR DRIVEN LATHE FOR TURNING LARGE SHELLS

Illustrations of the principal machines referred to are shown in Figs. 14, 15 and 16. Fig. 14 shows the 36 in. heavy duty engine lathe used for the third operation. While of seemingly conservative design, this machine has several features which call for more than passing mention. The strain of constant heavy cutting on rough forgings demands more than ordinary stiffness, and both the main spindle and the tailstock spindle are supported in such a manner as to insure the desired rigidity. The drive is from a variable speed motor, with a minimum amount of gearing, which is entirely enclosed. The headstock is of box form, the side walls imparting considerable added stiffness to the spindle bearings.

A very liberal amount of bearing surface is provided for the carriage, while the attention given to such important

details as lubrication and the provision of dust scrapers to prevent the entrance of cuttings beneath the carriage are points which appeal to the judicious purchaser.

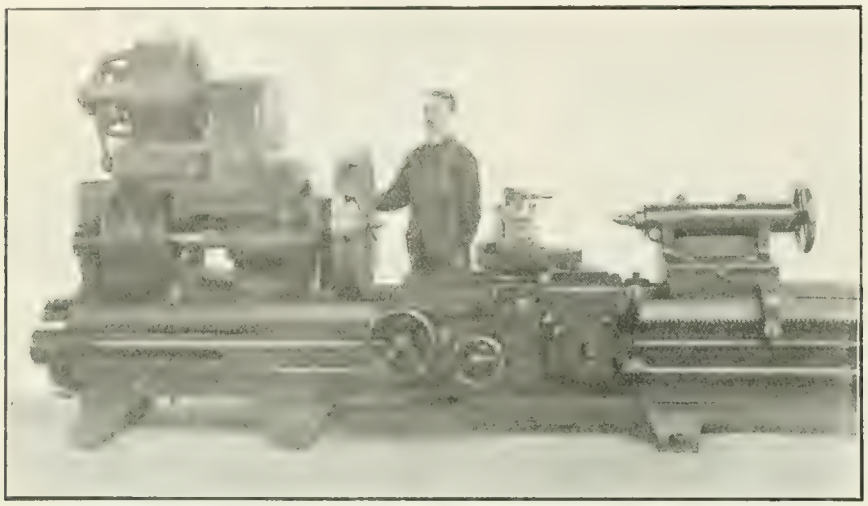


FIG. 16 30-IN. ENGINE LATHE FOR GROOVING AND BAND TURNING.

The machine which is of the most immediate interest at the present moment is the heavy projectile boring lathe, shown in Fig. 15. This machine swings 36 in., and is suitable for rough and finish boring projectiles from 6 in. to 14 in. diameter. The design throughout is of a most substantial nature. The bed sits flat on the foundation over its entire length, flat tracks and large cross section being prominent features in the design.

The headstock is of box construction, with all gears enclosed, the direct connected motor being mounted on a pedestal above the rear bearing. The front spindle bearing is 8 in. dia. x 23 in. long, these dimensions conveying some idea of the liberal proportions throughout. The bearings and gears, which are entirely enclosed, are lubricated continuously from a high level tank contained in the head, the oil being constantly pumped up from the bottom of the headstock.

The 35 horse-power motor is of the variable speed type, and the gearing through which it drives gives three mechanical changes controlled by handwheels. The electrical control of the motor gives 20 variations, which, combined with the gearing, gives 60 different face plate speeds from 2½ to 77 revs. per min. The control shaft extends along the front of the bed, and the con-

Sequence of Machining Operations for 9.2 in. Howitzer Shell Forgings.

Drill Center Hole and Face Nose of Shell

Performed by heavy radial drill. The shell is dropped over an arbor which fits the shell, and which is located central with drill spindle. The twist drill used is a little smaller than the size of the bottom of the thread in the nose, enough stock being left to make a reaming operation. After the hole is drilled twist drill is taken out, and a pilot facing cutter is used, which sweeps off the nose end of the shell, giving a flat surface, a little larger than is required for the finishing end.

Cutting-Off the Open End

For this operation heavy cutting-off machines are used, the shell being held in the spindle of the cutting-off machine, back against a stop, or in some cases a heavy engine lathe is used, to the face-plate of which is attached a heavy split cast iron chuck, open end of which runs in steady rest.

Rough Turning Forgings

This operation is performed on 36" heavy duty engine lathe, and the open end of the shell is placed on an expanding arbor which grips the inside bore, the tailstock having a revolving center, fitting in the hole already drilled in operation 1. This machine is arranged with a profiling attachment, so that the roughing cut will turn the outside of the shell to shape.

Boring Out the Shell

This operation is performed on a 36" projectile boring lathe, which is motor driven. To the faceplate of the lathe is bolted a heavy cast iron split chuck, which is supported on the outer end by heavy steady rest. The shell is slipped into the chuck, and clamped in position. The projectile boring lathe has a heavy square steel bar running through the tailstock, and is driven by all steel gearing, and has sufficient power to carry a three fluted reaching reamer, each cutter of which has serrated edges for breaking the chips. After this cutter is driven in the desired depth, it is withdrawn and the second cutter bar takes its place. The second cutter bar is of acorn shape, having two high speed steel cutters of the desired shape to finish the internal bore of the shell. This operation demands a heavy machine, as while the operation is performed in a comparatively short time, the character of the work must be perfect.

Finish Body Turn

This operation is performed on a 30" heavy duty engine lathe, the shell being mounted on a special arbor, conforming to the inside diameter of the shell, with the arbor extending through the shell, and held in position by nuts on either end of the arbor, which is driven from the faceplate. The lathe is provided with a special forming attachment, which enables the operator to not only turn the outside diameter of the shell to an exact size, but also gives a perfect form to the nose of the shell.

Boring and Threading the Nose

For this operation 26" heavy duty lathe is used, the large end of the shell being held in chuck bolted to faceplate of the lathe, and body of the shell running in steady rest. The lathe is provided with a turret on the carriage, enabling the use of a number of tools in rotation for this operation, the hole being reamed out to the proper size for threading, the nose of shell being faced to a finish, the thread being cut by collapsible tap, and a tool being used of suitable shape to face up the inside of the shell back of the thread.

Waving and Undercutting

A 30" heavy duty lathe is used on this operation, or special lathe of heavy design, equipped with a waving and undercutting attachment. This attachment consists of a fixture bolted to the bed of the lathe, and having at the back two tools operated by cams which remove the stock and undercut the corners. The front tool on the fixture has the required number of depressions for the number of waves required, and is operated by a cam on the faceplate which completes the form, giving the waving motion required.

Counterboring and Threading the Base

A heavy duty 30" lathe is used having a large cast iron split chuck secured to the faceplate, with the open end running in steady rest. On the cross-slide of the lathe is located a heavy turret with the necessary tools required for the counterboring operations and facing of the end of shell. The threading is performed by a chaser of the desired pitch, which requires a number of cuts to cut the thread to the desired size.

Pressing the Copper Band to Place

The band being heated is slipped over the shell, and forced into the groove prepared for it, either in a steam hammer, by means of two half circle dies, a few blows only being required to force it into its place, or by an hydraulic press, either method giving very good results.

Turning the Copper Band

This operation is performed on a 30" heavy duty lathe, with special attachment, or a single purpose lathe with special attachment, the tool of the attachment roughing the copper band to an approximate shape, and the other tool finishing the band to an exact size and shape. To the fixture carrying the finishing tool is a special attachment for undercutting the copper band to suit the specifications.

Facing the Base Plug in Position

The base plug being screwed in place, the shell is then chucked in heavy duty 26" lathe, having a split cast iron chuck bolted to the faceplate, open end of which runs in a steady rest. The base plug having been left a little thicker than the depth of counterbore in the shell, the surplus stock is then removed, giving a perfectly flat surface on the base of the shell.

Turning the Base Plug

The base plug is a drop forging of suitable size with ample stock for finishing operations. The forging is chucked, faced and turned to the proper diameter, then threaded to an exact size, leaving the large diameter a little longer than is required to fill the recess in the shell, this surplus stock being taken off as stated in operation 11.

After the above operations have been completed, having been inspected at intervals during the process of manufacture, it is then necessary to varnish the inside and bake same. This leaves a perfect glass-like surface for the high explosive. Before shipment the shells are painted with vaseline, to prevent them from rusting. The work throughout has to be of a very high character, in order to suit the requirements, and conform to the specifications insisted upon.

trol handle is carried by a bracket, which can be moved along the bed as desired, giving complete control over the motor from the position most convenient for the operator.

As boring operations form almost the entire work of this lathe, special provision in the shape of a self-oiling roller type thrust bearing has been provided to prevent trouble under continuous heavy duty.

The tailstock is designed to carry a square boring bar of generous proportions, and made from a steel forging. The bar is fed forward by a pinion engaging with a rack on its underside. The feed shaft extends along the back of the bed. Mounted on the back end of the rack pinion shaft is a large worm wheel, the worm which drives it being driven from the feed shaft through a small train of spur gears.

The movement of the bar is controlled by the large hand spiders on the tailstock. Eight variations in feed are provided from .005 in. to .030 in. per spindle revolution. The total length of feed of the boring bar is 48 in. at one setting of the tailstock.

In addition to being securely clamped to the bed, the tailstock is fitted with a tail brace which engages with a rack in the centre of the bed, to prevent slipping under excessive thrust pressures.

The forward end of the bar is supported by an A-shaped bracket, which can be adjusted close to the mouth of the forging. This bracket aids greatly in eliminating vibration, and assists in the production of accurate work from irregular forgings. The steady rest is of stiff box section, with four rests, and has a capacity of from 6 in. to 20 in. in diameter.

When in use, this machine is fitted with boring heads of any desired style, the curved nose interior being formed by suitable cutters, which are fed straight into the forging, the travel of the boring bar being in a straight line only.

The engine lathe shown in Fig. 6 is a 30 in. double-geared type, suitable for performing the various operations involved in grooving, waving and band-turning or forming. Although not of such massive design as the lathe shown in Fig. 14, it possesses all the elements of rigidity, the tailstock being liberally proportioned and securely bolted to its base block.

The four-sided tool post, shown in the illustration, is that which is ordinarily supplied. When equipped for grooving and waving, a special rest is substituted, consisting of a lower slide, which is mounted directly in the carriage, and has cross adjustment by a hand screw. A tool slide is mounted on this lower slide.

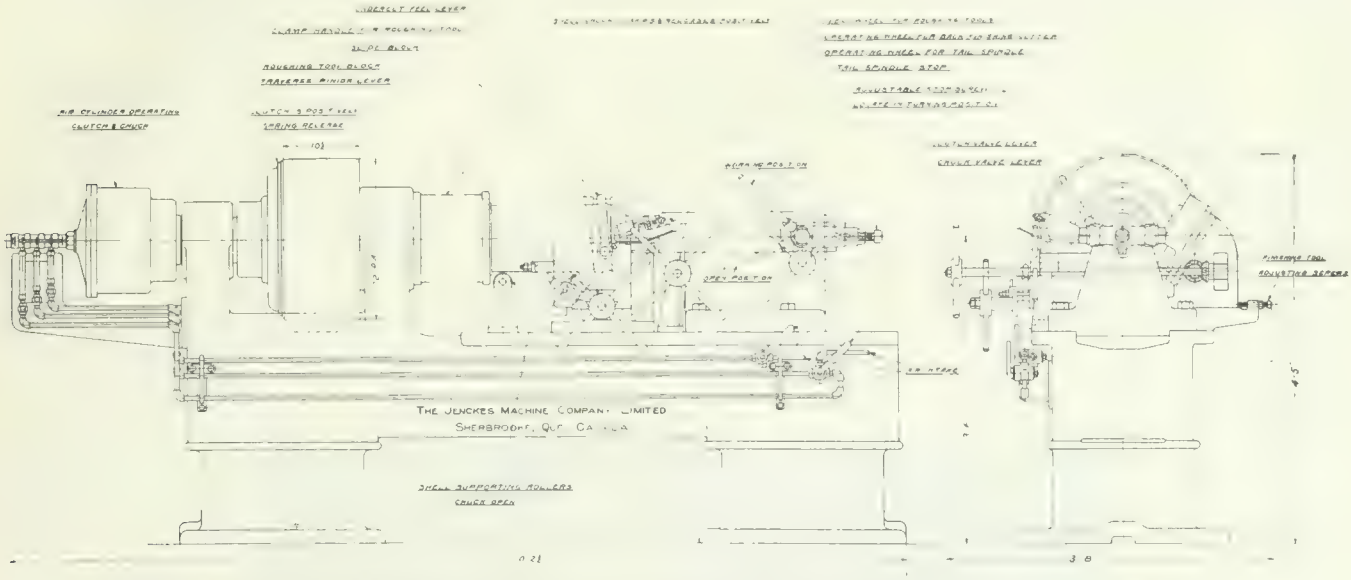


FIG. 17. SPECIAL PURPOSE MACHINE FOR TURNING DRIVING BANDS ON SHELLS UP TO 9.2 IN. DIA

To obtain the waving motion, this tool slide is moved back and forth parallel with the bed by means of an eccentric mounted on a cross shaft, which extends to the back of the cross slide. Bevel gearing drives this cross shaft from a shaft along the back of the lathe. This latter shaft is geared to the main spindle of the head, and suitable change gears are provided for obtaining the number of waves required by the various shells.

While a machine of this type can be utilized for forming the bands, it is not always desirable to use a machine of such capacity on single operation work, except on the largest size shells. For use on shells from 8 in. to 12 in. dia. special band turning machines have been designed, one of which is shown in drawing, Fig. 17.

This machine has been placed on the market by the Jenckes Machine Company, of Sheerbrooke, Que., and is described as a single purpose air actuated band lathe, the drawing showing the arrangement for the 9.2 in. shell.

The bearings are cast integral with the bed, and are of large size, the front one being 9¾ in. dia. x 7 in. long, and the rear 6 in. dia. x 7 in. long. Both bearing caps are machine fitted, and secured by four heavy studs, the forward cap being interlocked with the bearing to take the end thrust without end shift. Bearings are babbitt-lined and provided with shims for taking up wear.

The tailstock is a very rugged casting, located and bolted to the bed to suit the size of shell being machined. The spindle is 5 in. diameter, finished by grinding, and holds a heavy centre fitted to a No. 5 Morse taper. The spindle has a quick movement of about 6 in., actuated by rack and pinion. Its exact position is determined by a swinging stop at the rear, which drops over the end of the spindle when it has advanced far enough. A limited adjustment is provided by screw and lock nut in the stop. Thus the centre acts as a stop and a bearing for the shell, enabling the band to be finished the correct distance from the end.

The driving spindle is steel and hollow, finished inside and outside; the outside by grinding on dead centres. The chuck is built into the extension of the spindle, and is of the collet type, the jaws being opened and closed positively by compressed air. It is operated by an air cylinder at the rear, the controlling valve of which is at the operator's right hand, below the tailstock. In closing the jaws, the shell is pushed forward until stopped by the tail centre. Jaw movement continues until the full pressure of the cylinder is exerted. The drive is through a single clutch pulley, 22 in. diameter, 10½ in. face. The pulley is bronze bushed and runs loose on the spindle. The clutch is the full dia-

(Continued on page 549.)

The Development of Quick Acting Forging Presses--I.

By A. J. Capron, M.Inst. C.E.

The accompanying article formed the subject matter of a paper presented at the International Engineering Congress, San Francisco, last September. Recent progress and present states of the art of forging, together with the relative advantages of the quick-acting forging press over the steam hammer, constitute the salient features of the detail contents.

DURING the past ten years great developments have taken place in the art of forging, and over widening fields of industries, requirements in forgings have increased rapidly. In the first place, large forgings are required, particularly for the increased calibre of guns that have been coming into use, and for turbine drums, wheels, and spindles, in many cases requiring an ingot of as much as 100 tons weight.

Again, forgings are being much more extensively used in preference to steel castings. This applies particularly to marine work, where reliability is the first consideration, and some saving in weight is of more consequence than economy in production. It also applies largely to forgings of all kinds for general engineering work. When steel castings were introduced, they were used in many cases to replace forgings, at first often made in iron and subsequently in steel, the steel castings effecting a great saving in the cost of machining, particularly in the case of articles of intricate form. The introduction of high-speed steel during the last fifteen years has so reduced the cost of machining that forgings have been replacing castings, in many cases advantageously as regards the cost of production, and their use in this direction is continually extending. This development is greatly assisted by the improvements that have been made in the art of forging.

For the production of the heavier forgings, presses have been used in preference to hammers for as long as thirty years in many of the large steel works; but such presses are comparatively slow in their action, and it is only within the last ten years that great improvements have been made in their design and construction, and more particularly in their speed of working, which has rendered presses suitable for almost all classes of work, except the lightest forgings, which come within the range of small steam hammers or drop-stamps.

Forging Press and Steam Hammer Comparison

The press possesses many advantages over the hammer in its effect on the material, in the manipulation of the forging, in output and economy in working, and in absence of noise and vibration, which, in the case of heavy hammers, is always objectionable, and often detrimental to adjacent buildings and machinery.

Effect on the Material

Dealing first with the effect on the material, the squeeze of the press penetrates to the centre of the forging, as is evidenced by the bulging of the sides of the forging at each stroke; whereas the blow of the hammer has much more of a surface effect, often leaving the sides of the forging quite concave unless the power of the hammer is very ample. As a result of this difference of action, the hammered forging shows a slightly finer texture on the surface, but a distinctly mor open grain of metal towards the centre. The pressed forging, on the other hand, shows a fairly fine and practically uniform texture throughout the entire section.

Individual tests may not always show a very marked difference between pressed and hammered forgings, because a good deal depends on the relative powers of press and hammer to the size of the forging, the temperature at which the work is done, and the subsequent annealing or heat treatment; but in the course of the regular manufacture of tires, for example, it has been found that much better and more reliable tests have been obtained from the press than from the hammer. This advantage of the press is recognized by Government requirements for forgings which stipulate that, for rolled or hammered steel, the ingot must have an initial section eight times the finished section, whereas those pressed need have an initial section of four times only.

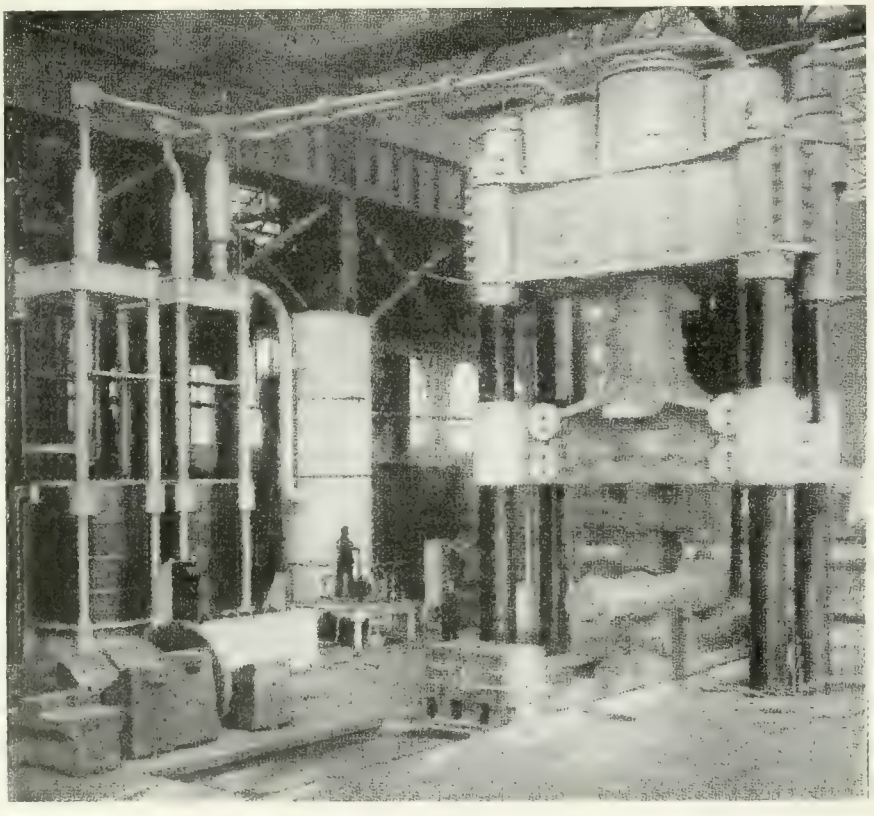


FIG. 1. MODERN FORGING PRESS OF 6,000 TONS CAPACITY.

Manipulation of the Forging

For the expeditious and accurate manufacture of forgings, a great deal depends on the ease and convenience with which the forging itself and the tools required for its production can be handled; and comparing the action of a press with the blow of a hammer, it will be readily understood that the advantage in these respects is entirely on the side of the press. In the first place, it is essential in working under a hammer that the forging should lie true on the anvil, otherwise a fair blow can-

not be struck, and an objectionable shock may be caused to the crane carrying the forging, and perhaps also to the men who are manipulating it; whereas a press will bring the forging to its correct position on the anvil without causing any jar and without interfering with the effect of the forging stroke.

When using tools under a hammer, much greater care must be used to place them correctly and to hold them in position, because the repeated blows of the hammer tend to displace them. A press on the other hand, once the tool is correctly placed, holds it in position until the cutting or forging stroke is completed. This enables such work as cutting or necking to be done much more easily and accurately under a press than under a hammer. For making a tapered forging with a press, a wedge-shaped block to give the correct taper can be laid on the anvil without any fixing. With a hammer, such an arrangement would require fixing to prevent its being displaced.

To forge accurately to size with large presses, a scale or indicator-dial can be used, worked from the cross-head, which enables the operator to read the reduction made at each stroke and to work the forging down to the finished size without any measuring. With small presses, a gauge piece is often used between the tool-faces which enables the forging to be made exact to size. With a hammer neither of these methods can be used conveniently.

Output

In almost all classes of work the press has a great advantage over the hammer in the matter of output. The blow of the hammer produces a very limited effect, generally reducing the forging by only the fraction of an inch, whereas the press will make a reduction of several inches per stroke, which, in straightforward cogging or rough forging work, naturally increases the output enormously. A good modern forging-press of 2000 tons will make as much as twenty 3-in. (75-mm.) strokes, or a total penetration or reduction of the forging of 60 in. (1.500 mm.) per minute. In rounding up or finishing a forging, such a press will work up to 60 strokes a minute, so that it is as fast as a hammer in finishing, and much superior to a hammer in cogging and rough forging.

As an instance of the output obtainable with a modern quick-acting press, a 2000-ton press of the steam intensifier type, starting with a 45-in. (1.143 m.) ingot, has cogged down and finished a 30-ft. (9-m.) length of well-finished 15-in. (381-mm.) shaft in one heat, using only flat tools. With a hammer of equivalent power, this work would have required not less than three heats. As another instance, a 1000-ton press, working on 24- in. (600 mm.) ingots, has forged 31 tons of 15-in. (375-mm.) round shafts in eight hours, and as much as 34 tons of miscellaneous forgings have been produced in eight hours by the same press. These are undoubtedly performances which could not be approached by any hammer.

With forgings of a more intricate shape, the advantages of a quick-acting press over a hammer are even more marked, because the same advantage in speed of penetration is obtained combined with much greater facility in handling the forging and, at the same time, the production of a forging more accurate to shape and size. As an instance, an 800-ton press, which is nominally equivalent to a 7-ton hammer, has produced the forgings for an anchor weighing 11 tons in three days. Properly, this size of work should have been done under a press of 1,200 tons, which could have cut the time occupied to about one-half.

Hollow forging is another class of work for which the press is much better adapted than the hammer. This is particularly the case in expanding operations for making hoops or drums, because the mandrel and its supports stand up far better against the squeeze of the press than against the blow of the hammer, resulting in more expeditious and better work.

Economy in Working

The principal factor in economy in working is the much larger amount of work that can be done in a heat under a good quick-acting press than under a hammer, as there is not only the actual saving in time, but considerably fewer heats are required to produce the same weight of forgings, and consequently the expenditure in fuel in reheating is greatly reduced. Besides this, the steam consumption of a good modern press is barely half that of a hammer for the same output.

Actual results over extended periods with presses have shown that in the production of solid, heavy forgings, such as shafts, the consumption of coal for steam production averages 3 cwt. (150 kg.) per ton of forgings; but for general work the consumption may be taken at from 3 cwt. to 5 cwt. (150 kg. to 250 kg.) per ton. It is evident that with a hammer a great deal of useful work is lost in vibrations; and in a paper on "Power Forging," with special reference to forging-presses, by Gerdau and Mesta, published in the Journal of the American Engineer, July, 1911, it is assumed that this loss amounts to one-third of the useful work, which is probably not over the mark. A calculation by the same authors gives the following results for equivalent powers of hammer and press:

Steam hammer, per stroke, 8 lb. (3.63 kg.) steam.

Steam, hydraulic press, per stroke, 3.7 lb. (1.68 kg.) steam.

An exact comparision is difficult to obtain; but the statement made above—that the steam consumption of a good modern press is barely half that of a hammer under average working conditions—is probably well within the mark.

When coal-fired furnaces are used for heating the forgings, it is often possible by means of the waste heat from the furnaces to raise sufficient steam for working the press. This is generally more convenient and economical than using gas-fired heating furnaces and independently-fired boilers.

Absence of Noise and Vibration

The press, with its silent working and absence of vibration, contrasts very favorably with the hammer, which causes much inconvenience and often considerable detriment to adjacent furnaces and buildings and to the working of any machine-tools in its vicinity. In many cases the inconvenience caused by hammers to adjacent establishments has been so great that, on this account, it has been necessary to replace them by presses. Besides this, the foundation required for the press is very small and inexpensive compared with what is required for a hammer; and when the nature of the soil is unfavorable, this difference is accentuated. The working of the press is also much less detrimental to the tools which can often be of cheaper construction and require less frequent renewals.

Capacity of Press and Equivalent Power of Hammer

The following table, which gives the maximum diameter of ingot that each power of press is capable of dealing with effectively and the equivalent power of steam-hammer, will be of assistance in making a comparison of the two methods of forging:—

Ingot Diameter In.	Ingot Diameter mm.	Press Power tons	Hammer Power tons
5	125	100	0.50
6	150	150	0.75
8	200	200	1.00
10	250	300	2.00
12	300	400	3.00
14	350	500	4.00
16	400	600	5.00
20	500	800	7.00
24	600	1000	10.00
30	750	1200	15.00
36	900	1500	20.00
48	1200	2000	40.00
60	1500	3000	80.00
72	1800	4000	120.00
84	2100	5000	
96	2400	6000	

From this table it will be seen that the power of the press bears a fairly direct proportion to the diameter of the ingot, but the power of the hammer required increases much more rapidly, being nearly proportional to the square of the diameter or the sectional area of the in-

got. For instance, for an ingot 24 in. (600 mm.) in diameter, the power of press is 1,000 tons, and the hammer 10 tons; but for a 48-in (1,200 mm.) ingot, the power of press is 2,000 tons, and the corresponding hammer 40 tons, and, consequently, the heavier the work the greater is the advantage of the press over the hammer.

As stated above, for the heavier classes of work, presses have been used in many of the principal steel works for as long as thirty years, the power of such presses most generally used, up to twenty years ago, being from 2,000 to 3,000 tons, though during this period some much more powerful presses, up to 10,000 tons, have been put down for forging armor plates and for special purposes. During the next ten years—that is, up to ten years ago—owing to the increased size of guns and other forgings required, a good many presses of 4,000 tons have been adopted.

During the last ten years—that is up to the present date—owing to the further increase in the size of guns, and also to the larger forgings required for marine work, particularly turbine-drums and spindles, the power of press required has increased correspondingly, 6,000 tons being the power most recently adopted for the heaviest work of this class.

Method of Driving Press

To explain the development in the use of the press, some mention must be made of the improvements that have been introduced in the method of driving. The earlier forging-presses have generally been driven by means of pumping-engines working direct into the press cylinders, the working pressure being usually from 2½ to 3 tons per sq. in. (400 km. to 480 km. per sq. cm.). For large presses this method gives satisfactory results, but it has never been used to any extent for presses of medium or small power, for which greater simplicity and a higher speed of working, especially in finishing, are more essential.

Another method is to make the press purely hydraulic, working it from an accumulator. For certain special work, such as piercing projectiles or billets for tube-making, in which a long stroke without any pause is desirable, this system is undoubtedly the best. For ordinary forging operations, however, for which a short, rapid stroke is essential, this system has only been adopted to a limited extent and is applicable only to presses of comparatively small power.

The system that fulfils the requirements of forging best is the steam, hydraulic intensifier. For a good many years it has been used to some extent, but it is only within the last ten years that it has come into general use and been adopted extensively for presses of small and medium power as well as for the heaviest forging-presses. The advantages of the steam-intensifier presses are that, in its latest and best form, it is capable of fulfilling adequately all the requirements of forging.

These include sufficient rapidity of action in all its movements—that is, the idle stroke when lifting the press-head and bringing it down to its work and the forging stroke or penetration. The idle stroke should be from 6 in. to 12

FIG. 2. ELECTRICALLY-DRIVEN TURNING GEAR FOR ROTATING FORGINGS.

in. (152 mm. to 305 mm.) a second, according to the power of the press and the nature of the work, and the forging stroke up to 3 in. (76 mm.) per second, according to the resistance of the forging. Also there should be no pause or dwell either when the tool first touches the work—that is, before the forging stroke commences— or at the end of the forging stroke; that is to say, the return stroke should commence directly the penetration is completed, any pause causing loss of time as well as chilling the forging. The length of the forging stroke is usually from 1 in. (25 mm.) up to 6 in. (150 mm.), or 8 in. (200 mm.) in the case of very large presses and the speed of such forging from 10 up to 50 strokes a minute, a total penetration of 60 in. (1,500 mm.) a minute being obtainable when the power of the press is well up to its work and the forging handled expeditiously.

For rounding or finishing a forging, a very rapid stroke is desirable; a good intensifier press of as much as 6,000 tons being capable of working up to 40 strokes a minute, and smaller presses proportionately quicker up to 100 strokes a minute. With these speeds of working an efficient control-gear is desirable both to limit the forging stroke and also to prevent any overrunning of the intensifier in case the load on the press is suddenly removed, owing to the forging or tool slipping or other accidental cause. So successfully has efficient control-gear been applied to intensifier presses that they can be worked quite safely and easily at the high speeds mentioned. Presses already constructed on this system range from 100 up to 6,000 tons power, the larger presses giving proportionally equally as good results both in forging and in rapid finishing strokes.

Forging Operations

Fig. 1 illustrates an up-to-date forging-press of 6,000 tons power, engaged in forging a solid shaft. This press is driven by two intensifiers, arranged to work simultaneously or independently by means of catches on the handing-lever. Working simultaneously, the intensifiers give a forging stroke of 10 in. (250 mm.) and a speed of from six to ten strokes a minute, according to the penetration required. When short strokes for finishing are required, either intensifier can be used and the press can be worked up to forty strokes per minute.

The full equipment for such a press, to enable it to deal advantageously with the various classes of work, includes the following:—

Mandrel-gear, giving the mandrel-blocks a travel of about 30 ft. (9 m.) on each side of the press.

An extended base of sufficient strength so that the full power of the press can be exerted on the mandrel-blocks when they are spaced at the maximum distance apart required for expanding work, such as turbine-drums or gun-jackets.

Manipulating gear for handling forgings without the use of a crane:—this is particularly useful for certain classes of work, such as forging armor-plate and turbine-wheels, and also in some cases for cogging ingots.

Transverse tool-changing gear:—this is useful for forging crank shafts and similar work when it is desirable to change from flat tools to V-shaped or swaging tools. The gear enables both top and bottom tools to be changed very

quickly without taking the forging from under the press.

Turning-gear for rotating the forging: —The most convenient form is a self-contained electrically-driven gear, suspended from the crane-hook. Fig. 2 illustrates such a gear. Preferably this should be provided with a friction-clutch which slips during the instant that the press grips the forging.

A press with the above equipment is suitable for practically all classes of heavy work. Examples of forgings made under such a press will be given in the continuation of the present article next week.

OPEN-HEARTH VS. ELECTRIC FURNACE FOR COMMERCIAL STEELS

THE fundamental question is one of cost, and any authentic figures are always welcomed as throwing fresh light on this subject, which is of great commercial interest. The fact that the electric furnace can successfully compete with the crucible process, and in some cases with the small converter, is, we think, established, but a comparison of the electric furnace with modern open-hearth furnace is open to discussion, and is made the subject of an article by S. Cornell in a recent issue of the Metallurgical and Chemical Engineering.

In order to provide data on this point a table has been compiled for a year's operation of a large open-hearth plant and compared with what is claimed to be practice obtainable in an electric furnace plant of the same capacity. The open-hearth plant consisted of 80-ton furnaces, having a production of 200 tons of ingots per day for each furnace, compared with 20-ton electric furnaces, approximately the same capacity per day.

Dealing with the materials necessary to make one ton of steel, and including all consumable material and cost of repairs, it is calculated that the cost per ton of steel is $14.50 for the open-hearth against $18 for the electric steel. The cost and quantity of raw material is taken to be the same in both cases, and the difference is due entirely to a fuel cost for producer gas being 54 cents for the open-hearth, as against $4.40 for electric power in the electric furnace.

The general labor charges which are common to both processes is worked out at $1 per ton of steel, whilst the cost of general repairs is given as 6 cents per ton.

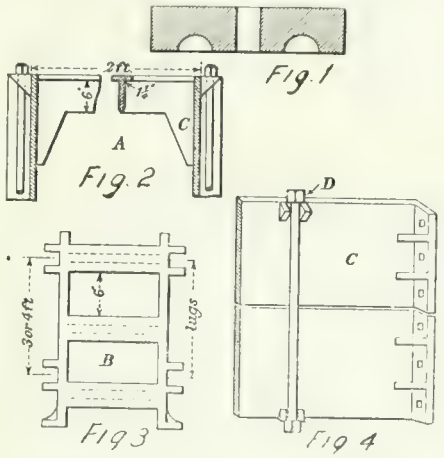
From a careful consideration of the outlay necessary in installing electric furnaces of sufficient capacity to produce the same tonnage as a set of open-hearth furnaces, it is calculated that in order to compete in cost the electrical energy must be produced at below 1 cent per kilowatt-hour.

The present electrical equipment using blast furnace gas cannot do better than 7 cents per kilowatt-hour.

HINTS TO FOUNDRYMEN

A CONTRIBUTOR to "Engineering" says it appears to be general practice to make patterns for all classes of castings, light or heavy, and to ignore loam work as being either too costly or causing too much dirt in the shops. This is entirely wrong, as I think some of those in charge have but little knowledge of how loam work can be made to advantage over sand, both as regards cost and keeping the shop just as clean.

I was talking to a gentleman the other day, who thought that his was quite a modern concern. They were engaged on one class of engine, etc., or what might be called repetition work. There was one casting in particular being made from patterns; this was what molders commonly call a block fly-wheel,



ILLUSTRATING HINTS TO FOUNDRYMEN

up to 12 ft. in diameter, as shown in sketch (Fig. 1). Now to make such castings as these in sand is not only increasing the cost, but causing a lot of unnecessary hand labor for the molders.

Anyone that claims to know anything of modern foundry practice could take 10 per cent. from the cost of a casting of this kind by making it in loam, and more than another 10 per cent. from all others that were required. There is plenty of room yet for green, dry sand and loam work in a modern foundry, and castings can only be produced economically by sound judgment in the use of them.

Jobbing Foundry-Box Parts

The writer has worked in plenty of jobbing foundries doing a fairly decent class of work that could be cast on its joint, but if anything came along that had to be cast vertical, it had to be rejected as being something out of their particular line. Now if the boxes had been made to tackle any class of work, such castings as hydraulic bodies, rams, etc., could have been made.

All that is required is a crane of sufficient height to turn them up, to make the bars in the box with lips as shown in the sketch (Fig. 2) like a T, and to place lugs (Fig. 3) at the back about 3 ft. or 4 ft. apart, for the boxes to be bolted with these when they are being used vertically. A cross-section of the box is shown at A; the top and distance of the bars should be apart are indicated at B, while C shows a side view of a pair of boxes, and D the bolts and method of fastening. These can be made in lengths to the requirements of the foundry; 6 ft. and 9 ft. are fairly handy. The boxes can be bolted at the ends to make any length required; they are perfectly safe, no plating or the back of the bars or ramming being required.

Splitting Castings

The best method of treating splitting plates for castings is to glue a thin layer of asbestos over them; when cast they will rap out, leaving a smooth, clean face.

LARGE SHELLS: PRODUCTION PROBLEMS AND POSSIBILITIES.—V.

(Continued from page 545.)

meter of the inside of the pulley, and is of the taper cork insert type. It is operated by a separate valve and the release is by springs. The thrust of the spindle is taken at the forward end bearing, a take-up collar being provided at the rear of the same bearing.

The tool base is bolted firmly to the bed and carries both roughing and finishing heads. On the 9.2 in. the roughing is split into two operations. Each tool is fully adjustable, but when once set, they can be removed and replaced with precision. The feed of both tools is by a single screw to positive stops. The undercutting tool is on a separate block mounted on the front slide at the correct angle and is fully adjustable. The feed is through lever and cam. The rear or finishing tool is so mounted that the tool slides past the band and shears it to the exact size and shape. The tool block is securely bolted to the base, but is slightly adjustable to and from the cut. It can also be rotated if necessary, so the tool will cut both ends of the band to correct size. The feed is by rack and pinion, with handle in a convenient position for the operator.

Two roller supports are provided on the bed so that the shell can be lowered by an air hoist or other means into the chuck, and in line with the centre. The rollers are not in contact with the shell when it is rotating.

EDITORIAL CORRESPONDENCE

Embracing the Further Discussion of Previously Published Articles, Inquiries for General Information, Observations and Suggestions. Your Co-operation is Invited

GALVANIZING CONDUITS

THE manufacture of galvanized conduits at the plant of the Orpen Conduit Co., Toronto, Ont., presents several interesting features, the principal one being that the pipe is copper-plated before being galvanized. Copper-plating is a protective covering of great value in resisting corrosion, forming an ideal "couple" between the metal of the tube and the zinc. The zinc is, therefore, deposited on copper and not on iron by means of the electro-deposition process, thus its full value as a rust preventative is secured.

This conduit, which bears the trade name of "Xceladuct," is a high-grade mild steel butt-weld pipe of special quality, being heavier than ordinary tubing. The pipe for the straight conduit is received at the factory in 10-ft. lengths, and is made in Canada; the bends are, of course, shorter. The pipe is threaded at both ends, one end having a coupling when shipped. The conduit is made in sizes from ½ in. to 6 in. inclusive.

Pickling Process

The first process consists of pickling, which is done to remove the scale, etc., from the pipe. For this process there are installed a number of wood tanks, the first containing a potash solution for removing oil or grease from the pipe. The pipes are then dipped in a tank containing sulphuric acid, which removes the scale. They are then dipped in another tank containing muriatic acid, which gives a smooth surface to the pipe.

On the completion of the foregoing, the pipes are laid out on a flat table, where they are carefully inspected. A powerful light at one end enables an examination of the inside to be made. Any defective pipes are laid to one side, and the sound ones are taken over to the plating department.

Plating and Galvanizing

In the plating department are installed a series of five tanks in one row, each being 14 feet deep, and having a capacity of 4,000 gallons. The tanks sit in an asphalt pit, and are constructed of wood or steel, according to the character of solution which they contain. Before being dipped in the first tank, the pipes are assembled in a "basket," in which they are held until this process is completed. The basket is made of copper, and is constructed so as to hold the pipes vertically. It has a capacity for 175 lengths, each 10 ft. long, of 1½-in. pipe, equivelent to 1,750 ft. The larger sizes, being heavier, fewer pipes are dipped at one operation.

The basket is suspended from and carried along by means of an electrically-operated hoist on an overhead runway, extending the full length of the tank. At the end of the operation, when empty, the baskets are returned on an overhead runway at each side of the tank. The hoist has lifting and lowering motions for use when dipping the pipes.

The pipes are dipped in three different solutions before being copper-plated. After being in the copper-plating tank the prescribed length of time, they are taken out and dipped in the zinc tank, where they remain about 45 minutes. They are then taken out and put in the rinsing tank.

The electrical equipment for the zinc and copper tanks consists of two motor-driven plating dynamos. One unit consists of a Canadian Hanson & Van Winkle Co. plating dynamo, 8,000 amperes, 6 volts., direct-connected to an 85 h.p. C.G.E. motor running at 470 r.p.m. The other unit is of the same make and size, but belt-driven by an 80 h.p. C.G.E. motor. The wiring from the dynamo is taken under the floor, up the outside of the tank, and connected to the anodes.

Drying and Insulating

After the pipes have been rinsed, they are taken from the basket and placed vertically over a grating through which air is passing from a blower. The pipes are thus thoroughly dried before being insulated and again inspected. For the insulating or enameling process, the pipes are laid inclined on a table and the enamel flows from an overhead tank through them into a shallow tank, whence it is pumped back by means of a motor-driven rotary pump to the overhead tank. The pipes are then placed vertically over a grating to dry, a current of air passing through accomplishes this.

They next go to the labeling table, where they are laid flat and two labels affixed—one factory label and one for the Underwriters. At this stage the pipes are carefully examined by the Underwriters' inspector, who selects one from each batch to be tested. Before leaving the table, a coupling is screwed on one end of each pipe, after which they are tied in bundles ready for shipping. The test pipe is cut in two sections on a hack saw machine, and a length taken to the inspector's office, where it is tested to ascertain if the zinc coating and enamel are adhering in a satisfactory manner. The tests are very thorough, as the conduit must conform in all respects to Underwriters' rules.

Elbows

The above-mentioned processes cover the straight lengths of conduit only. The elbows are treated in a somewhat indifferent way, chiefly as regards handling. Short lengths of pipe are received at the factory, threaded at both ends. The first requirement is to bend them to the required angle and radius. For the larger pipes a belt-driven bending machine operated from the line shaft is used, while the smaller size pipes are bent in a steam-operated machine. In both cases different forms are used to suit the various sizes of pipe.

The elbows, as in the case of the straight pipes, undergo the pickling process and in the same set of tanks. The elbows are, however, scrubbed with sand after being pickled. They are then copper-plated in the same tank as the straight lengths, but have a separate tank for the galvanizing process. The current for the zinc tank is furnished by a plating dynamo, which is also connected to the zinc tumbling tank used for galvanizing the couplings. The dynamo supplies current at 6 volts, 400 amperes. After being galvanized, which takes about 30 minutes, the elbows are taken out and hung on a rack to dry, and then taken over to the insulating tank to be enameled inside. After being enameled, they are hung on racks to dry, and are then inspected and stamped the same as the straight conduit. The elbows are also inspected and tested between the various processes. All sizes are treated in the same way.

Couplings

As already stated, a coupling is supplied with each length of conduit. The first process consists of pickling, which is done in the same set of tanks as the pipe and elbows. They are also copper-plated in the same tank, and are held in wire baskets during the process. For galvanizing, there is a special tumbling tank installed, in which the couplings are revolved for three hours. When the galvanizing process is completed, the couplings are taken out and washed in cold water. They are then put in wire baskets, washed again in hot water, and afterwards laid on a wire screen to dry. They are afterwards taken to the store room to be used as required.

CHUCKS VERSUS FIXTURES

By D. A. Hampson.

ALMOST every part that is made in quantities of one hundred or more requires some sort of fixtures if the work is to be done cheaply and the parts have to be at all interchangeable. The commercial side should determine how elaborate these fixtures are to be; but before going to the expense of making or even of designing them, it is well to take account of stock and see if there are no standard adjustable fixtures which can be used instead.

Into this class come chucks, dull heads, jigs, vises, etc. On work that is to last but a few days or a few weeks, such tools can be made to show almost as great a production as specially made-up tools, and show a nice saving in initial expense and ultimate discarding. Two cases in which ordinary drill chucks were used to advantage will be reviewed.

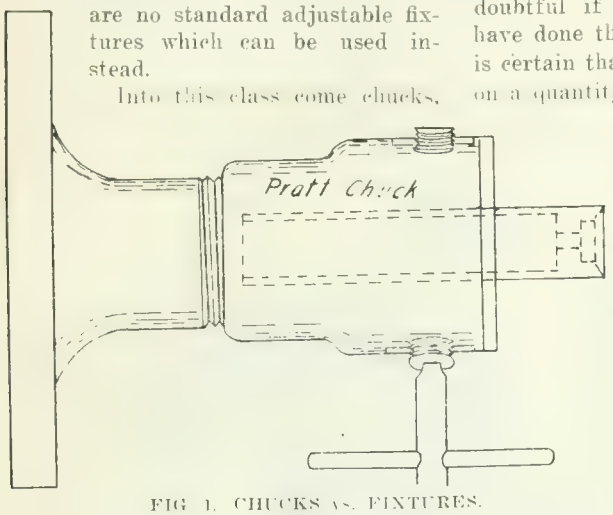


FIG. 1. CHUCKS vs. FIXTURES.

Ten thousand brass shells were to have an ⅛-inch hole drilled through the end. Instead of making a special holder for these, a Pratt drill chuck of the familiar two-jawed type was selected from among the "spares" and a cast iron base made to support it. The drawing shows this and also the wrench for opening and closing, the wrench being made a tight fit in the socket, so it is always in place. A quicker or more satisfactory fixture would have been impossible to make, and when the job was done we had not added as much as a dollar to the obsolete tool account.

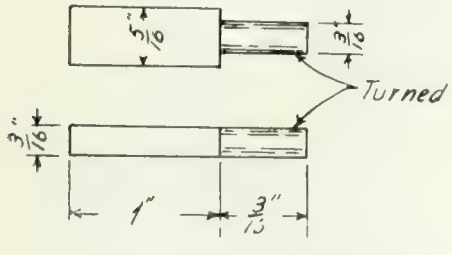


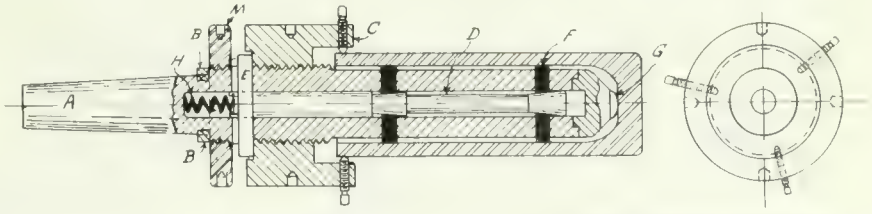
FIG. 2. CHUCKS vs. FIXTURES.

A "trial lot" of a new mechanics' tool required a thousand pieces of 3-16 x 5-16 drawn steel, with a symmetrically turned stem at one end. There was in the tool room a nearly new two-inch, two-jawed Cushman drill chuck. To this we fitted a shank that was fitted to the "centre" taper of a lathe spindle. The jaws of the chuck being V-shaped, formed a perfect driving and centering medium. After milling the pieces to length, they were turned in the chuck, suitable stops having been arranged for position, length and diameter. It is doubtful if any special fixture would have done the work more accurately—it is certain that they would not have paid on a quantity of this size.

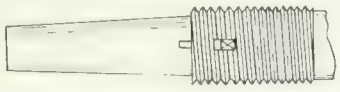
EXPANDING MANDREL

By G. Barrett

THE expanding mandrel is undoubtedly one of the most called-for tools required in the manufacture of shells, and its use has never been so widespread as it is at the present time. The one which we illustrate herewith was designed for a lathe which had been temporarily out of commission owing to the lack of a hollow spindle.



AN EXPANDING MANDREL.



The end of the mandrel A is fitted to the tapered hole in the lathe spindle and is prevented from turning by means of the pins B which engage with two corresponding slots in the spindle nose.

In operation the shell is first placed over the mandrel till it touches the point G. The nut C is then tightened against the cotter F, causing it to draw up the rod D, the inner end of which projects into the hole H. By this means the tapered diameters on the rod D force the dogs F outward against the shell. By tightening the three set-screws shown in the nut, a firm grip is assured, since the strain of the cut will have the tendency to still further tighten the nut.

To remove the shell the set-screws are slackened off and the nut C is screwed back. A slight pressure is then applied to the cotter E by means of the nut M. This forces the rod back and relieves the strain on the dogs sufficiently to allow the spring H to force the rod back the remaining distance and thus release the shell.

TRADE WITH BRITAIN

AN increase in Canadian trade with Great Britain, particularly in exports, is shown in British trade returns for the nine months of the present fiscal year ending October 31st last, which have reached the Trade and Commerce Department. The 1915 figures of Canadian trade for this three-quarter period were $188,824,340, as compared with $174,000,000 in 1914. Of the former total, over $138,500,000 was in Canadian exports. Canada's trade was considerably less than Australia's, which totalled $300,000,000, probably due to the purchase of war munitions. Great Britain's trade with the United States increased by about $350,000,000. The October figures also show a decrease in the disproportion evident between British imports and exports since the war. From this, the inference is drawn that the English people are beginning to economize by cutting down consumption of all but necessities.

Truing an Oilstone.—To true an oilstone, the Mechanical World suggests the following method:—Take a piece of soft pine board of any thickness, about 8 in. wide and 3 ft. or 4 ft. long. Lay it on a bench and fasten it with a handscrew or other clamp. Put on some clean, sharp sand, screened about as fine as that used for plaster work. Use no water, and rub the stone back and forth over the board in sand. This will give a flat surface to the stone in a short time. Care should be taken to move the stone on straight lines, so as not to give it a warped surface. If a fine surface is wanted, a finer grade of sand or sandpaper may be used to finish with.

PROGRESS IN NEW EQUIPMENT

A Record of New and Improved Machinery and Accessories for the Machine, Pattern, Boiler and Blacksmith Shops, Planing Mill, Foundry and Power Plant

GRINDING ENDS OF SHELLS

AT the square end of a shrapnel shell there is a small turning hub or centre projection which has to be removed before the shell is completed. There are various ways of removing this stock, but production is the essential factor in all. The Gardner Machine Co., Beloit, Wis., has developed a special grinding machine for this operation,

This equipment is also used for cutting off the square or angular hubs from base plates in high explosive shells as well as on shrapnel casings. From a grinding standpoint, the operation is the same in both cases. In some instances the hub is removed by some other process and the riveting done. It is then placed on the grinder and the balance of the base plate is removed, taking a light cut over the entire base of the shell as well.

The machine consists in the main of a very heavy base casting, with a 2-in. diameter spindle, mounted in either high-grade babbitt bearings or ball bearings. On each end of the spindle is mounted a "Perfection" ring wheel chuck, of improved design. These chucks contain 16-in. diameter abrasive rings selected for these operations.

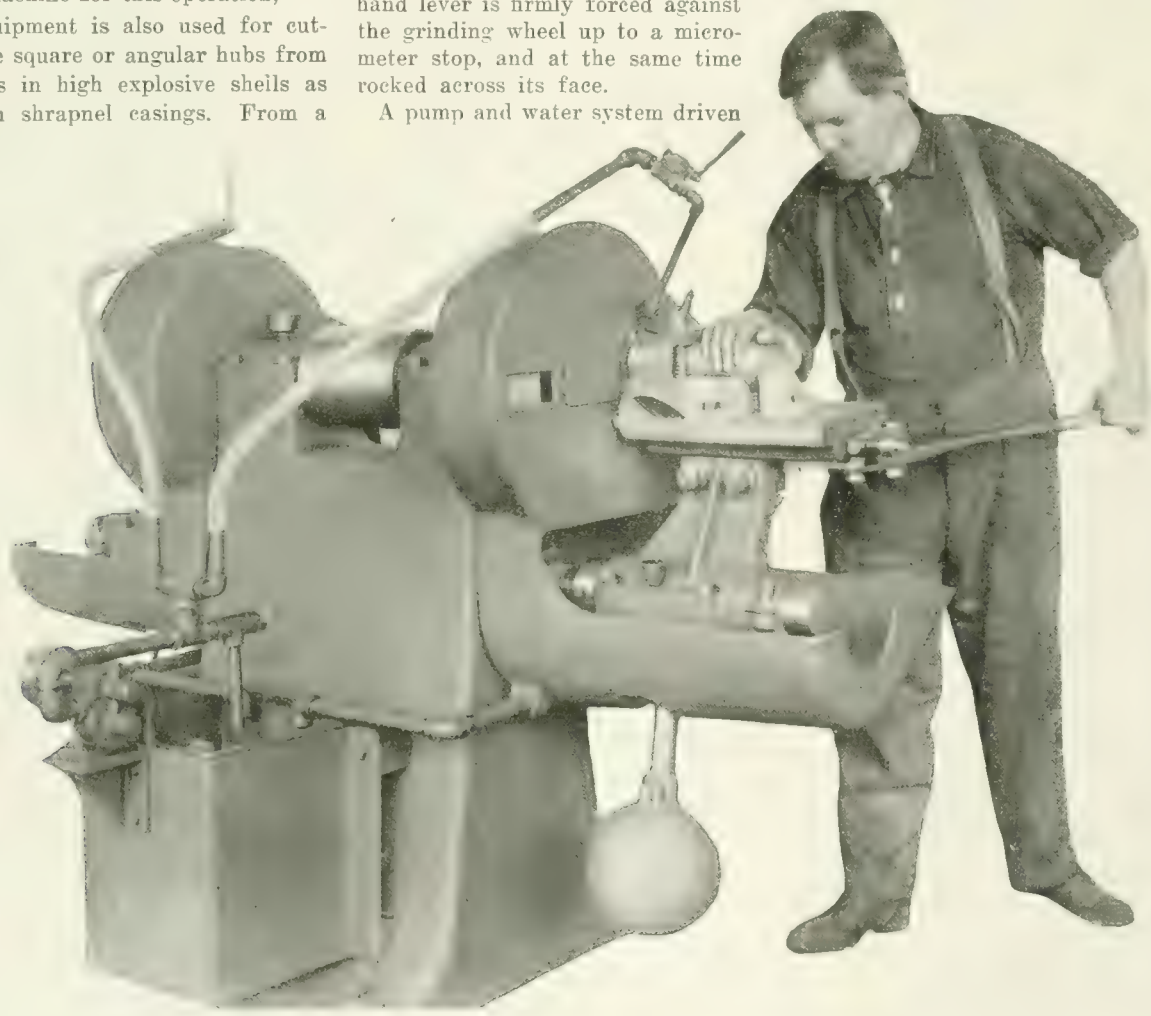
Lever feed work tables, supported on a rigid rocker-shaft running entirely through the base, serve the grinding wheels. The shell is quickly clamped into "V" fixture, and by means of a hand lever is firmly forced against the grinding wheel up to a micrometer stop, and at the same time rocked across its face.

A pump and water system driven from the counter-shaft directs the water or grinding compound at the point of grinding contact. The hoods and basin are one-piece castings.

The output obtained from one end of the machine varies according to the size of the projection to be removed, being from 40 to 100 per hour. This machine, with both ends equipped and operated by two men, gives double this output.

The complete equipment includes two 16 in. "Perfection" chucks, two 16 in. abrasive ring wheels, two semi-universal lever feed work tables, two shell-holding fixtures, water pump, with connections, countershaft and general supplies. The whole outfit weighs 4,000 pounds.

This firm also builds a No. 50 grinder, which is much heavier and more powerful than the one illustrated herewith, and which is also being adopted by manufacturers of 6-in. shells for these same operations.



MACHINE FOR GRINDING BASES OF SHRAPNEL SHELLS

DIAL FEED ATTACHMENT FOR LARGE SHELLS

THE Ferracute Machine Co. of Bridgeton, N.J., has recently developed an automatic dial feed attachment for use in cupping and re-drawing cartridge cases and other sheet-metal shells, the attachment being used in connection with straight-sided presses exerting pressures from 100 to 200 tons.

The illustration shows a 100-ton press fitted with one of these attachments, the dial having six recesses, it being essen-

tial that a recesss be in alignment with the centre of ram as it descends to insure the entrance of the punch in the partially drawn shell. Pressure on the treadle will cause the press to stop instantly at any portion of its stroke.

The dial has an intermittent motion, being at rest while the press makes a stroke. A cam on the main shaft gives motion to the rack that partially revolves the dial yoke. An additional cam on the main shaft operates the "lock" mechanism. This lock is a lever containing a wedge-shaped end that fits each of the six notches in the circumference of the dial.

Connected to the lock mechanism is an "interrupter." When the lock is in a notch, indicating that the ram and dial-recess are properly aligned, the interrupter prevents a weighted rod from descending, but if by any mischance the lock should fail to enter its notch, the interrupter will change its position, allowing the weighted rod to descend and depress the treadle, causing the press to instantly stop, and thereby avert damage. After cause of trouble has been ascertained and adjustment of dial finished, the press may be made to complete its stroke by pulling down the handle-strap, the ascending ram elevating the weighted rod, and the treadle and treadle-rod assuming their first position.

The press is equipped with a combined friction clutch and brake. Pulling down the hand-lever connects the power to the shaft, giving motion to the press, while depressing the treadle releases the clutch and applies the brake. The machine is, therefore, under perfect control at any position of its stroke.

There are several adjustments that give accuracy to the motion of the dial. For instance, the amount of rotation of the dial may be regulated by means of a roller at top of yoke, set-screws being provided to give exact position. The motion is also controlled by a brake which is automatically released during the locking process. There is an eccentric adjustment which provides for the accurate relation between the lock and its notch, the tension of the lock being regulated by means of an adjusting spring.

Although designed primarily for continuous action, the press with its attachment can be used intermittently, that is, automatically stopping at the end of each stroke. When running continuously, 12 shells per minute are produced.

1,000-TON HYDRAULIC CARTRIDGE CASE HEADING PRESS

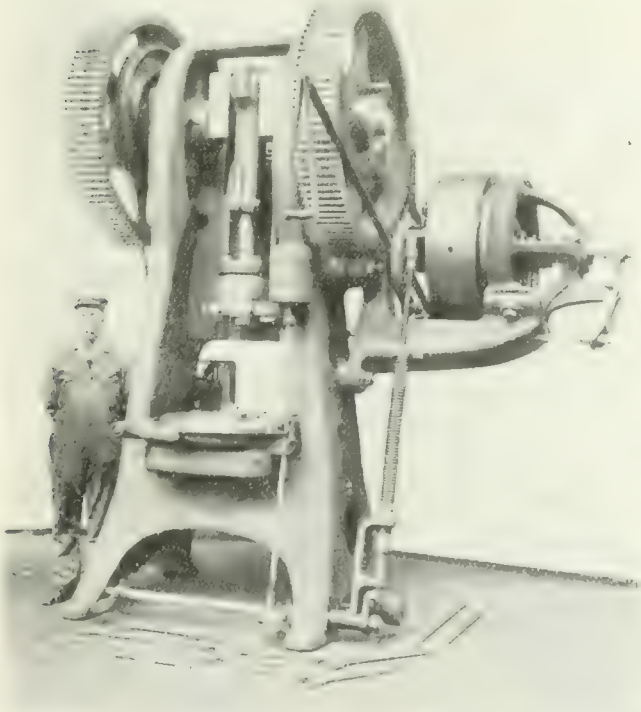
THE hydraulic press, illustrated, was designed for the heading of brass shells after they have been indented. The heading operation is accomplished by inserting a fullering block between the head of the press and the top of the cartridge case, the latter being held in place by a suitable die. As the pressure is applied, the fullering block causes the brass to flow outward in all directions, thus forming the head of the shell.

The press has a revolving turret with dies to receive three shells. This provides for an almost continuous operation, as there is always one shell awaiting the heading operation and one shell being unloaded, while the other shell is undergoing the heading operation. The rotation of this turret is controlled by an indexing device, so that the shell is accurately held in place directly beneath the fullering block.

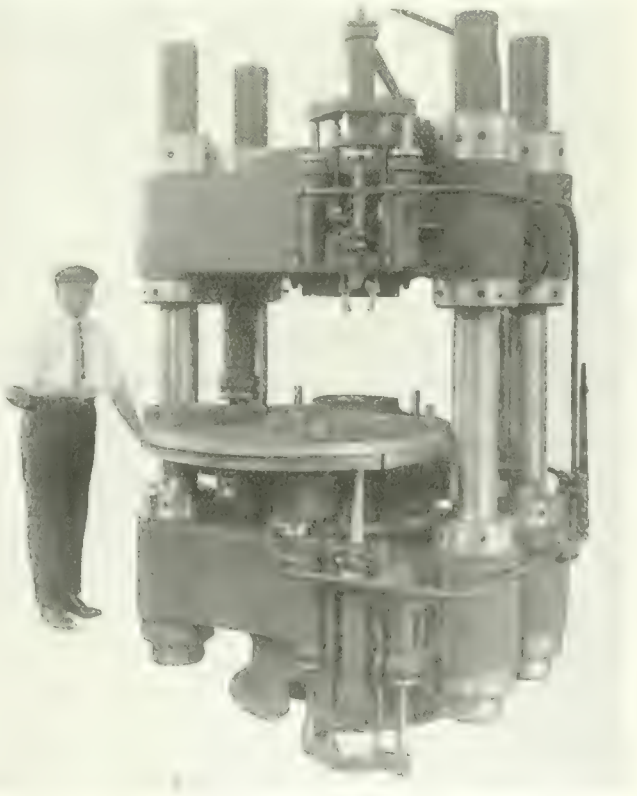
The indexing device is operated by a lever conveniently placed for the operator. By merely pulling the lever, the index latch is disengaged from the turret, clearing and releasing the turret for revolving. The photograph shows a rear view of the press. The lever controlling the indexing device is shown to the extreme right. The operating valve is entirely hidden by the press.

The turret revolves on a spindle mounted in ball bearings, which are set in the front side of the press between the strain rods. Handles placed around its outer edge at an equal distance apart are fitted for the purpose.

After the heading operation is completed, the shell is pulled from the die by an hydraulic ejecting device, which consists of two rams, one attached to the head of the press and the other to the base. Spring gripper jaws are attached to the upper ram for gripping the head of the shell. Each of these rams is provided with two auxiliary pull-back rams.



DIAL FEED ATTACHMENT FOR CUPPING AND RE-DRAWING CARTRIDGE CASES



1,000-TON HYDRAULIC CARTRIDGE CASE HEADING PRESS

The ram attached to the base of the press forces the shell up out of the die to a point where the gripper jaws on the upper ram can readily take hold of the newly-formed head. Pressure is then applied on the auxiliary rams for the return of the ejector rams. The finished shell is next removed from the gripper jaws of the upper ram and the device is ready for the next shell.

The use of two ejector rams, each working toward a common centre, makes the ejecting operation much more rapid and clears the turret in less time, so that it can be revolved more quickly for heading the next shell. The maximum pressure of the two ejector rams is 5 tons each.

The press is of steel construction throughout, the base and cylinder being cast in one piece. The ram has a diameter of 28 inches and a run of 12 inches. The press has an adjustable daylight of 30 to 45 inches.

The maximum total pressure capacity of the press is 1,000 tons, and the number of pressings per minute depends upon the capacity of the pump used for its operation. As a basis, the press will make 3½ pressings per minute with the pump furnishing 19¼ gallons of water per minute at a pressure of 3,250 pounds per square inch.

This projectile press is a new design and recent addition to those being built by the Hydraulic Press Mfg. Co., Mount Gilead, Ohio.

DOMINION ECONOMIC COMMISSION

AS a first step of the recently-appointed Federal Economic Commission, under Hon. J. A. Lougheed, towards securing working data from which to draw conclusions, a special census of Canadian industrial companies is to be taken. At the conclusion of the meeting held on Dec. 13 of the commission, R. H. Coates, Director of the Census and Statistics Branch, announced that a census of manufacturers would be taken by post next month. All manufacturers will be asked to fill out a census form, giving details as to capital invested, number of employees, wages, etc., and volume of production, distinguishing between war orders and general business.

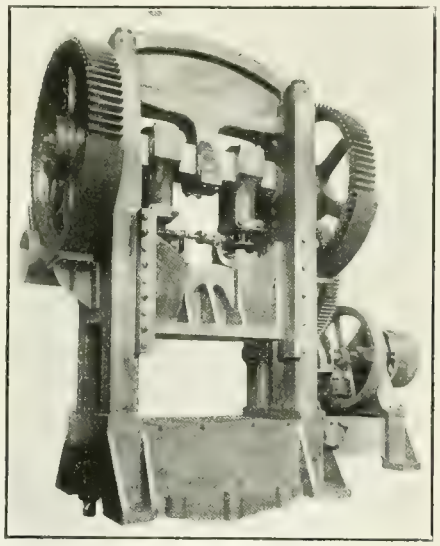
Efforts also will be made by the Commission to get the latest comprehensive and reliable information regarding agricultural production, including cost of production, market facilities, etc. In this connection the various agricultural associations will be asked to co-operate.

After the preliminary information sought is received, the Commission will visit various centres in sections and take public evidence as to needs, and recommendations looking to a better conservation of the national resources, and more economic methods of marketing, etc.

HIGH-DUTY POWER PRESS

FORCED production of automobile parts is creating a demand for stronger and heavier presses, with greatly increased factors of safety. The machine illustrated was recently developed by the Cleveland Machine & Mfg. Co., Cleveland, Ohio, for the production of automobile frame cross-bars and similar heavy forming, blanking and drawing.

A heavy spring drawing attachment (not shown) is mounted in bed of press, and is used for operating knock-out pads



HIGH DUTY POWER PRESS.

and drawing or pressure rings. The gearing is of steel throughout, with machine-cut teeth. The friction clutch is multiple disc type and very powerful.

The principal dimensions of the machine are as follows: Gross weight, 167,000 pounds; bed area, 72 in. R to L, x 48 in. F to B.; crank shaft, 10 in. diameter in bearings and 11¼ in. on crank pins; stroke of slide, 10 in.; distance bed to slide, stroke down and adjustment up, 26 in.; proportion of gearing, 45:1.

QUICK-FIRING GUNS

THE rapid development of artillery during the last few years has naturally led to the coining of a number of phrases to express the difference between the various types, and distinguish the new from the old and obsolete; while the rapid education of the general public in the elementary principles of modern warfare has brought some of these phrases into common use. It not infrequently happens that a whole series of remarkable improvements are designated for general use by a single expression. An excellent example of this is the term "quick-firing" as applied to modern gunnery.

Less than twenty years ago, it was recognized that the gradual development of the field gun had made so many changes necessary in the tactics of infantry that a radical improvement in the speed and accuracy of artillery fire was desirable. Men were no longer fighting in masses in the open, and they had found it more effective to offer only a fleeting target to the gun. Consequently the time required to load, run out, and aim the gun had to be reduced if the weapon was going to be of much use. Loading was enormously accelerated by the adoption of the single-acting breach mechanism, combined with a device for ejecting the empty cartridge case. The running in of the old gun to the firing position was necessary, because the recoil after firing was taken up by the gun and carriage as a whole. Hence, the weapon had to be run forward, set in position and re-aimed.

The Modern Gun

In the modern gun the barrel only moves, the energy of the recoil is taken up in an elastic press, and the barrel is returned to its original position by a spring. After firing, the modern gun returns instantly to the position it occupied before firing, and generally this does away with re-aiming. The improvements enumerated were first adopted by the French in 1897, and their famous 75-mm. gun can fire from twenty to twenty-five rounds per minute. Germany carried out an elaborate series of trials, extending over a long period, but it was only in 1905 that they adopted the quick-firing gun.

In the services the Maxims, Gatlings, and other automatic feed guns are not spoken of as quick-firers, that name being given to all weapons which are loaded by hand. Thus the 6-in. naval gun is a quick-firer and represents the maximum size of a quick-firing gun in the navy. The shell weighs 100 lbs., and can just be man-handled. The 7.5 in., the 9 in. and all heavier weapons are provided with regular hydraulic hoists and loading arrangements.

At the other end of the scale is the little 3-pounder, and from the 6-in. to the 3-pounder the firing arrangements are sensibly the same. Naval guns of greater than 6-in. calibre differ in the first instance from the 6-in. gun, in that the loading is done by machinery. With the main armament weapons of our battleships, the size and weight of the breech blocks renders it necessary to open and close the breech by hydraulic power; but the principle of the recoil arrangements is the same throughout.—Liverpool Journal of Commerce.

The MacLean Publishing Company
LIMITED

(ESTABLISHED 1888)

JOHN BAYNE MACLEAN - - - - - - President
H. T. HUNTER - - - - - - - General Manager
H. V. TYRRELL - - - - - Asst. General Manager

PUBLISHERS OF

CANADIAN MACHINERY AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

PETER BAIN, M.E., Editor.

Associate Editors,
A. G. WEBSTER. J. M. WILSON. J. H. RODGERS.

B. G. NEWTON - - - - - - Advertising Manager

OFFICES:

CANADA—
Montreal—Rooms 701-702 Eastern Townships Bank Building. Telephone Main 1255.
Toronto—143-153 University Ave. Telephone Main 7324.

UNITED STATES—
New York—R. B. Huestis, 115 Broadway. Phone 8971 Rector
Chicago—A. H. Byrne, Room 607, 140 South Dearborn St. Telephone Randolph 3234.
Boston—C. L. Morton, Room 733, Old South Bldg. Telephone Main 1024.

GREAT BRITAIN—
London—The MacLean Company of Great Britain, Limited, 88 Fleet Street, E.C. E. J. Dodd, Director. Telephone Central 12960. Address: Atabek, London, England.

SUBSCRIPTION RATES:

Canada, $2.00; United States, $2.50; Great Britain, Australia and other Colonies, 8s. 6d. per year; other countries, $3.00. Advertising rates on request.

Subscribers who are not receiving their paper regularly will confer a favor by letting us know. We should be notified at once of any change in address, giving both old and new.

Vol. XIV. DECEMBER 16, 1915 No. 25

PRINCIPAL CONTENTS.

Large Shells: Production Problems and Possibilities—V .543-545
The Development of Quick-Acting Forging Process—I.....546-549
General 549
Open Hearth vs. Electric Furnace for Commercial Steels ..Hints to Foundrymen
Editorial Correspondence 550-551
Galvanizing Conduits .. Chucks vs. Fixtures .... Expanding Mandrel.
General 551
Trade With Britain....Truing an Oilstone.
Progress in New Equipment 552-554
Grinding Ends of Shells....Dial Feed Attachment for Large Shells....1,000-Ton Hydraulic Cartridge Case Heading Press....High Duty Power Press.
General 554
Quick Firing Guns ...Dominion Economic Commission
Editorial 555
Preparation for Commercial Ascendency.
Selected Market Quotations 556-557
The General Market Conditions and Tendencies 558-561
Montreal Letter....Toronto Letter....Canadian Exports to Britain .... Compensation Act Adjustments .... Dominion Coal, St. Lawrence Season....Power Development at Muskoka....New Electric Steel Furnace Plant .... Dominion Trade Returns .. Ontario Mineral Output.
Industrial and Construction News .. . 562

PREPARING FOR COMMERCIAL ASCENDENCY

THE question of Canadian manufacturers being able to supply to the fullest extent possible, immediately, the munitions demand subsides, our own domestic requirements and develop concurrently and maintain an export trade that will transcend in volume all previous achievement, is one that should be considered and given tangible expression to now by individual or collective organization. We have organized for munitions production in a manner that has merited world-wide commendation. We can also organize for these others just as effectively, and without hampering in the slightest degree the meantime munitions production efficiency.

Organization for the manufacture of munitions was largely an individual firm affair, and, the Department of Trade and Commerce, Ottawa, notwithstanding, similar action is inevitable if we would corall in large part our domestic business and establish a world-embracing export trade. Evidence is not lacking that preparation is proceeding apace in the United States and even in Great Britain to not only maintain but to take hold of every available opportunity, both domestic and foreign.

In the United States, the American International Corporation has been organized with a capital of $50,000,000, and with the most prominent of that country's financiers and business specialists behind it. The avowed intention is to prosecute the most vigorous foreign trade expansion campaign in American history.

In Great Britain, irrespective altogether of the duration of the war, it is expected that in a very short time with the completion of the many large and specially-equipped munitions factories, there will be a wholesale release of firms, large and small, meantime engaged in the production of war material. By way of anticipating this, the Imperial Government, through the Prime Minister and Chancellor of the Exchequer, has stated definitely that the maintenance of a large and increasing export business is one of the essentials if victory is to be complete.

Export trade on Britain's part is, even now, war work, and the immediate future is ear-marked for its diligent prosecution. By no other means can her resources be husbanded and her efforts be so thoroughly concentrated on the task she and her Allies have undertaken to bring to its logical conclusion than that of retaining the world-wide commerce and market for her wares already established, and by enlarging their scope and service.

We have already hinted at the almost certainty of Canada's efforts lacking official Governmental backing. Under such circumstances individual firm enterprise must needs be forthcoming. Efficiency engineers, safety experts, and a myriad other departmental appointments have come to be recognized as part and parcel of our leading metal-working and general manufacturing establishments. May we suggest that a domestic and foreign trade department is now also highly desirable, manned by experts in each particular sphere, who will organize campaign plans, collect data, and generally arrange easy transition from war to peace-time pursuits.

Men fitted to grapple successfully with the problems of shell-making were neither hard to "spot" nor to develop, and we are of opinion that their prototypes having both a sufficiently wide commercial experience and intimacy with the manufacturing or practical side of any factory product, will be likewise as promptly available and as prolific of achievement.

Our plants generally are in a position with the cessation of hostilities to compass a greatly increased and more diversified output. To secure business in the coming time, to maintain full employment for men and machines will, however, necessitate "rustling" for both home and foreign orders. It should also be realized that war orders have increased the capacity and diversity of output of our competitors, making former competition none the less, but rather a great deal more. The need of organizing is therefore particularly and peculiarly urgent.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

Grey forge, Pittsburgh	$17 95
Lake Superior, charcoal, Chicago	17 75
Ferro nickel pig iron (Soo)	25 00

	Montreal.	Toronto.
Middlesboro, No. 3	$24 00	.....
Carron, special	25 00	.....
Carron, soft	25 00	.....
Cleveland, No. 3	24 00	.....
Clarence, No. 3	24 50	.....
Glengarnock	28 00	.....
Summerlee, No. 1	30 00	.....
Summerlee, No. 3	29 00	.....
Michigan charcoal iron.	28 00	.....
Victoria, No. 1	24 00	24 00
Victoria, No. 2X	23 00	24 00
Victoria, No. 2 plain	23 00	24 00
Hamilton, No. 1	23 00	24 00
Hamilton, No. 2	23 00	24 00

FINISHED IRON AND STEEL.

Per Pound to Large Buyers.	Cents.
Common bar iron, f.o.b., Toronto	2 50
Steel bars, f.o.b., Toronto	2.75
Common bar iron, f.o.b., Montreal	2.50
Steel bars, f.o.b., Montreal	2.75
Twisted reinforcing bars	2.55
Bessemer rails, heavy, at mill	1.25
Steel bars, Pittsburgh	...
Tank plates, Pittsburgh	...
Beams and angles, Pittsburgh	...
Steel hoops, Pittsburgh	

F.O.B., Toronto Warehouse.	Cents.
Steel bars	2.75
Small shapes	2.75

Warehouse, Freight and Duty to Pay.	Cents.
Steel bars	2.20
Structural shapes	2.30
Plates	2.30

Freight, Pittsburgh to Toronto.

18.9 cents carload; 22.1 cents less carload.

BOILER PLATES.

	Montreal	Toronto
Plates, ¼ to ½ in., 100 lb.	$2 75	$2 75
Heads, per 700 lb.	3 00	3 00
Tank plates, 3-16 in.	3 00	3 00

OLD MATERIAL.

Dealers' Buying Prices.	Montreal.	Toronto.
Copper, light	$13 75	13 50
Copper, crucible	16 25	16 00
Copper, unch-bled, heavy	15 75	15 00
Copper, wire, unch-bled	15 75	15 25
No. 1 machine compos'n	12 00	11 75
No. 1 compos'n turnings	11 00	10 00
No. 1 wrought iron	10 00	10 00
Heavy melting steel	9 50	9 50
No. 1 machin'y cast iron	13 50	13 00
New brass clippings	11 50	11 00
No. 1 brass turnings	9 50	9 00
Aluminum	29 00	29 00
Heavy lead	5 25	5 00
Tea lead	$4 25	$4 25
Scrap zinc	12 75	12 00

W. I. PIPE DISCOUNTS.

Following are Toronto jobbers' discounts on pipe in effect Nov. 5, 1915:

	Buttweld Black	Buttweld Gal.	Lapweld Black	Lapweld Gal.
Standard				
¼, ⅜ in.	62	38½	....	....
½ in.	67	47½	....	....
¾ to 1½ in.	72	52¼	....	....
2 in.	72	52½	68	48½
2½ to 4 in.	72	52½	71	51½
4½, 5, 6 in.	....	....	69	49½
7, 8, 10 in.	....	....	66	44½
X Strong P. E.				
¼, ⅜ in	55	38½	....	....
½ in	62	45½	....	....
¾ to 1½ in.	66	49½	....	....
2, 2½, 3 in.	67	50½	....	....
2 in.	....	....	62	45½
2½ to 4 in	....	....	65	48½
4½, 5, 6 in.	....	....	65	48½
7, 8 in	....	....	58	39½
XX Strong P. E.				
½ to 2 in	43	26½	....	....
2½ to 6 in.	....	....	42	25½
7 to 8 in.	....	....	39	20½
Genuine Wrot Iron.				
⅜ in	56	32½	....	....
½ in	61	41½	....	....
¾ to 1½ in.	66	46½	....	....
2 in.	66	46½	62	42½
2½, 3 in.	66	46½	65	45½
3½, 4 in.	....	....	65	45½
4½, 5, 6 in.	....	....	62	42½
7, 8 in.	....	....	59	37½

Wrought Nipples.	
4 in. and under	77½%
4½ in. and larger	72%
4 in. and under, running thread	57½%

Standard Couplings.	
4 in. and under	60%
4½ in. and larger	40%

MILLED PRODUCTS.

Sq. & Hex Head Cap Screws	65 & 5%
Sq. Head Set Screws	70 & 5%
Rd. & Fil. Head Cap Screws	45%
Flat & But. Head Cap Screws	40%
Finished Nuts up to 1 in.	70%
Finished Nuts over 1 in.	70%
Semi-Fin. Nuts up to 1 in.	70%
Semi-Fin. Nuts over 1 in.	72%
Studs	65%

METALS.

	Montreal.	Toronto.
Lake Copper, carload	$21 50	$20 75
Electrolytic copper	21 25	20 50
Castings, copper	21 00	20 50
Tin	45 00	43 00
Spelter	21 00	18 00
Lead	6 75	7 00
Antimony	12 00	10 00
Aluminum	70 00	65 00

Prices per 100 lbs.

BILLETS.

	Per Gross Ton
Bessemer billets, Pittsburgh	$30 00
Open-hearth billets, Pittsburgh	31 00
Forging billets, Pittsburgh	52 00
Wire rods, Pittsburgh	40 00

NAILS AND SPIKES.

Standard steel wire nails, base	$2 80	$2 85
Cut nails	2 90	2 90
Miscellaneous wire nails	75 per cent.	
Pressed spikes, ⅝ diam., 100 lbs.	3 25	

BOLTS, NUTS AND SCREWS.

	Per Cent.
Coach and lag screws	60 and 5
Stove bolts	82½
Plate washers	40
Machine bolts, ⅜ and less	65
Machine bolts, 7-16 and over	50
Blank bolts	50-7½
Bolt ends	50-7½
Machine screws, iron, brass	35
Nuts, square, all sizes	3¾c per lb off
Nuts, hexagon, all sizes	4¼c per lb. off
Iron rivets	67½
Boiler rivets, base, ¾-in. and larger	$3.75
Structural rivets, as above	3.75
Wood screws, flathead, bright	85, 10, 10 p.c. off
Wood screws, flathead, brass	67½ p.c. off
Wood screws, flathead, bronze	60 p.c. off

LIST PRICES OF W. I. PIPE.

Standard. Nom. Diam.	Price. per ft.	Extra Strong. Sizes Ins.	Price per ft.	D. Ex. Strong. Size Ins.	Price per ft.
⅛in	$.05½	⅛in	$ .12	½	$ .32
¼in	.06	¼in	.07½	¾	.35
⅜in	.06	⅜in	.07½	1	.37
½in	.08½	½in	.11	1¼	.52½
¾in	.11½	¾in	.15	1½	.65
1 in	.17½	1 in	.22	2	.91
1¼in	.23½	1¼in	.30	2½	1.37
1½in	.27½	1½in	.36½	3	1.86
2 in	.37	2 in	.50½	3½	2.30
2½in	.58½	2½in	.77	4	2.76
3 in	.76½	3 in	1.03	4½	3.26
3½in	.92	3½in	1.25	5	3.86
4 in	1.09	4 in	1.50	6	5.32
4½in	1.27	4½in	1.80	7	6.35
5 in	1.48	5 in	2.08	8	7.25
6 in	1.92	6 in	2.86	....	....
7 in	2.38	7 in	3.81	....	....
8 in	2.50	8 in	4.34	....	....
8 in	2.88	9 in	4.90	....	....
9 in	3.45	10 in	5.48	....	....
10 in.	3.20	....	....	....	....
10 in.	3.50	....	....	....	....
10 in.	4.12	....	....	....	....

COKE AND COAL

Solvay Foundry Coke	$6.25
Connellsville Foundry Coke	5.65
Yough Steam Lump Coal	3.63
Penn. Steam Lump Coal	3.63
Best Slack	2.99

Net ton f.o.b. Toronto.

COLD DRAWN STEEL SHAFTING.

At mill	25%
At warehouse	20%

Discounts off new list. Warehouse price at Montreal and Toronto.

MISCELLANEOUS

Solder, half-and-half	0.23½
Putty, 100-lb. drums	2.70
Red dry lead, 100-lb. kegs, per cwt.	9.65
Glue, French medal, per lb.	0.15
Tarred slaters' paper, per roll	0.95
Motor gasoline, single bbls., gal.	0.25½
Benzine, single bbls., per gal.	0.25
Pure turpentine, single bbls.	0.87
Linseed oil, raw, single bbls.	0.87
Linseed oil, boiled, single bbls.	0.90
Plaster of Paris, per bbl.	2.50
Plumbers' Oakum, per 100 lbs.	4.50
Lead Wool, per lb.	0.11
Pure Manila rope	0.16
Transmission rope, Manila	0.20
Drilling cables, Manila	0.17
Lard oil, per gal	0.73
Union thread cutting oil	0.60
Imperial quenching oil	0.35

POLISHING DRILL ROD

Discount off list, Montreal and Toronto 40%

PROOF COIL CHAIN.

¼ in.	$9.00
5-16 in.	5.90
⅜ in.	4.95
7-16 in.	4.55
½ in.	4.00
9-16 in.	4.20
⅝ in.	4.10
¾ in.	3.95
⅞ in.	3.80
1 inch	3.70

Above quotations are per 100 lbs.

TWIST DRILLS

	%
Carbon up to 1½ in.	55
Carbon over 1½ in.	25
High Speed	
Blacksmith	55
Bit Stock	60 and 5
Centre drill	20
Ratchet	20
Combined drill and c.t.s.k.	15

Discounts off standard list.

REAMERS

	%
Hand	25
Shell	25
Bit Stock	25
Bridge	65
Taper Pin	25
Centre	25
Pipe Reamers	80

Discounts off standard list.

IRON PIPE FITTINGS.

Canadian malleable, A, 25 per cent.; B and C, 35 per cent.; cast iron, 60; standard bushings, 60 per cent.; headers, 60; flanged unions, 60; malleable bushings, 60; nipples, 75; malleable, lipped unions, 65.

TAPES

Chesterman Metallic, 50 ft.	$2.00
Lufkin Metallic, 603, 50 ft.	2.00
Admiral Steel Tape, 50 ft.	2.75
Admiral Steel Tape, 100 ft.	4.45
Major Jun., Steel Tape, 50 ft.	3.50
Rival Steel Tape, 50 ft.	2.75
Rival Steel Tape, 100 ft.	4.45
Reliable Jun., Steel Tape, 50 ft.	3.50

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28	$3 50	$3 50
Canada plates, dull, 52 sheets	3 25	3 25
Canada Plates, all bright	4 60	4 75
Apollo brand, 10¾ oz. galvanized	5 50	5 50
Queen's Head, 28 B.W.G.	6 00	6 00
Fleur-de-Lis, 28 B. W. G.	5 75	5 75
Gorbal's Best, No. 28	6 10	6 10
Viking metal, No. 28	5 25	5 25
Colborne Crown, No. 28	5 70	5 80
Premier No. 28	5 40	5 50
Premier, 10¾ oz.		5 75

BOILER TUBES.

Size	Seamless	Lapwelded
1 in.	$14 25	
1¼ in.	15 00	
1½ in.	15 00	
1¾ in.	15 00	
2 in.	15 00	10 00
2¼ in.	16 50	11 00
2½ in.	17 50	12 85
3 in.	25 00	13 20
3½ in.	28 00	16 25
4 in.	33 00	20 75

Prices per 100 feet, Montreal and Toronto.

WASTE.

WHITE.	Cents per lb.
XXX Extra	0 11½
X Grand	0 11
XLCR	0 10¼
X Empire	0 09½
X Press	0 08¾
COLORED.	
Lion	0 07¾
Standard	0 07
Popular	0 06¼
Keen	0 05½
WOOL PACKING.	
Arrow	0 17
Axle	0 12
Anvil	0 09
Anchor	0 07
WASHED WIPERS.	
Select White	0 08½
Mixed Colored	0 06¼
Dark Colored	0 05¼

This list subject to trade discount for quantity.

BELTING RUBBER

Standard	50%
Best grades	30%

BELTING—NO. 1 OAK TANNED.

Extra heavy, single and d'ble, 40 &	10%
Standard	50%
Cut leather lacing, No. 1	$1.20
Leather in sides	1.10

ELECTRIC WELD COIL CHAIN B B.

⅛ in.	$12 75
3-16 in.	8.85
¼ in.	6.15
5-16 in.	4.90
⅜ in.	4.05
7-16 in.	3.85
½ in.	3.75
⅝ in.	3.60
¾ in.	3.60

Prices per 100 lbs.

PLATING CHEMICALS

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.06
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium carbonate	.15
Ammonium chloride	.11
Ammonium hydrosulphuret	.35
Ammonium sulphate	.07
Arsenic, white	.10
Copper sulphate	.10
Cobalt sulphate	.50
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.10
Nickel carbonate	.50
Nickel sulphate	.15
Potassium carbonate	.40
Potassium sulphide (substitute)	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.45
Sodium bisulphite	.10
Sodium carbonate crystals	.04
Sodium cyanide, 127-130%	.35
Sodium hydrate	.04
Sodium hyposulphite (per 100 lbs.)	3.00
Sodium phosphate	.14
Tin chloride	.45
Zinc chloride	.20
Zinc sulphate	.07

Prices Per Lb. Unless Otherwise Stated.

ANODES

Nickel	.47 to .52
Cobalt	1.75 to 2.00
Copper	.22 to .25
Tin	.45 to .50
Silver	.55 to .60
Zinc	.22 to .25

Prices Per Lb.

PLATING SUPPLIES

Polishing wheels, felt	1.50 to 1.75
Polishing wheels, bullneck	.80
Emery in kegs	.4½ to .06
Pumice, ground	.05
Emery glue	.15 to .20
Tripoli composition	.04 to .06
Crocus composition	.04 to .06
Emery composition	.05 to .07
Rouge, silver	.25 to .50
Rouge, nickel and brass	.15 to .25

Prices Per Lb.

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents

Montreal, Que., Dec. 13, 1915.—Reports from all sources continue to show that satisfactory conditions prevail throughout the steel, iron and metal industries, and while munitions are the chief feature of the activity, many other lines are in more or less good demand.

Pig Iron

Local conditions in the pig iron market are little changed from the previous week. Production continues at maximum capacity to supply the demands made upon the steel makers. In spite of the high prices, considerable inquiries are coming in from foundries. The question of transportation of both ore and iron is having a tendency to advance prices on some grades. A disturbing factor for the coming year is the possibility of a shortage in vessel tonnage for the shipment of ore.

Steels

The tension in the steel situation shows little indication of relaxation; in fact, the pressure upon producers seems to be increasing, and the period of future deliveries is constantly being extended. While bars and billets are principally in demand, the inquiries for bars, plates, etc., continue to increase.

Many mills are limiting orders to a proportion of customers' requirements, and in some instances inquiries are not even considered. Producers of steel have business booked for many months ahead, and in a great number of cases orders for second and third quarters of 1916 cannot be taken on.

The continued scarcity of tungsten keeps the figures for high-speed steel excessively high, and little relief is immediately expected. However, by the spring of next year, the situation may be somewhat relieved. Present quotations are $2.50 to $3.25 per pound.

Metals

The general condition of the metal market is dull, with prices firm. Local spelter shows a slight advance, while aluminum records another jump of 5c per pound. Present conditions will likely prevail until the close of the year.

Copper.—The lively condition of the copper market for the past few weeks has now ceased, and indications are that little change will be noted for the remainder of the month. Slight declines are quoted in the United States markets, but local prices are holding firm.

Tin.—No new developments have taken place during the past week, and the general dullness continues, with the possibility of a further slight decline before the opening of the New Year. A considerable supply of tin is in sight, and this has weakened the foreign markets. However, the local dealers are quoting last week's figures of 45 cents per lb.

Spelter.—Conflicting reports are being circulated regarding the spelter situation, and it would seem that speculators are trying to force prices up. It is generally conceded that recent advances are due to this, more so than supply and demand. However, the quiet condition at present tends to retain firmness, and, while foreign prices have declined somewhat, local dealers have advanced their quotations 1c per pound, which leaves the present price at 21c.

Lead.—The outlook from present conditions are that the market will show weakness in a short time, a decline being generally expected. Last week's quotation of 6¾c holds firm for the present.

Antimony.—The market is steady and prices are firm at 42 cents per lb.

Aluminum.—The demand for aluminum continues to boost the price, and inquiries are numerous. Local dealers have advanced their quotations from 65 cents to 70 cents per pound.

Old Material.—Local scrap conditions remain unchanged, with a fair amount of transactions passing. Heavy melting steel scrap is quite active, and the demand is increasing. Present prices show an advance of $10 per ton over last week. The shortage of aluminum has advanced the price of its scrap to 27 cents per pound.

CANADIAN GOVERNMENT PURCHASING COMMISSION

The following gentlemen constitute the Commission appointed to make all purchases under the Dominion $100,000,000 war appropriation:—George F. Galt, Winnipeg; Hormidas Laporte, Montreal; A. E. Kemp, Toronto. Thomas Hilliard is secretary, and the commission headquarters are at Ottawa.

Toronto, Ont., Dec. 14.—There is little change to note in the general situation. The revival in trade continues and the outlook is distinctly favorable. The export trade is increasing in volume while domestic trade has improved considerably of late. Railways report substantial increases in earnings, and bank clearings exceed last year as also those of the previous year, which are favorable indications as to the increase in the volume of trade, and improvement in conditions generally. The shortage of tonnage and high ocean freight rates are a serious inconvenience to importers and exporters, and have not only increased the cost of certain products but have affected deliveries also.

The steel market continues very strong with every possibility of higher prices. The demand for steel for shells is increasing and is greater than the Canadian mills can produce. Preparations are being made for turning out the large-calibre shells which will call for a considerable increase in tonnage. The machine tool trade is active and dealers report very satisfactory business. In the metal market, tin and spelter have declined, otherwise prices are unchanged. The market generally is quiet.

Steel Market

The extraordinary activity in the steel trade continues and there is no sign of any recession. The steel companies have more business than they can handle and are booked up for months ahead. The demand is so much greater than the Canadian mills can supply that concerns working on shell contracts are obliged to buy raw materials from the States. It is stated that several large contracts for steel forgings and round steel bars which have been under negotiation between Canadian concerns and American mills are held in abeyance temporarily. It is understood, however, that the contracts will eventually be placed in the States. Under prevailing conditions, prices of steel are bound to advance, the market being very strong. Boiler plates have advanced again, and higher prices for domestic steel and iron bars are expected any time. There is no change in the situation with regard to American bars, shapes, etc., and prices are still withdrawn.

The galvanized sheet market is very irregular. Many makers have discontinued quoting on sheets on account of the fluctuations in the spelter market. Prices of black sheets continue to advance and all other materials used in the manufacture of galvanized sheets are also higher. Prices of galvanized sheets are very fair, and are expected to go higher.

Prices continue to advance in the States and the export demand is increasing. The French government is enquiring for thousands of tons of round steel bars. Many of the mills are increasing their capacity, but are as far behind as ever on delivery. Steel bars are quoted at 1.70c base, and iron bars 1.80c base, Pittsburgh. Billets continue to advance

on heavy demand. Bessemer billets are now quoted at $30 and open-hearth billets at $31 Pittsburgh. Forging billets are unchanged at $52, and wire rods are higher at $40 Pittsburgh.

Pig Iron

The pig iron market is very strong and prices continue to advance. A large percentage of the tonnage is going into steel, there being little demand for foundry grads. "Hamilton" and "Victoria" brands have advanced $1, and are now quoted locally at $24 per ton. The market for pig iron in the States is becoming excited and prices are advancing. "Grey Forge" is now quoted at $17.95 Pittsburgh. It is understood that quotations on "Lake Superior" iron ore for the coming season have been made. "Mesaba Bessemer" is quoted at $4.25, which is 80c above this year's basis. On "Mesaba non-Bessemer," 70c advance over this year is asked.

Old Materials

There is little change to note with regard to the situation in old materials. The market generally is firm with higher prices for heavy melting steel, aluminum and lead, while the various grades of copper have also advanced slightly. The market is not very active but there is a fair demand for copper and heavy melting steel. There is a continued scarcity of aluminum; this has strengthened the market for scrap metal.

Machine Tools

The market is very active and there is a good demand for machinery for shells, principally for the larger sizes. Some orders for 8-in. shells have been placed, and the concerns thus favored are getting their plants in shape for machining them. There appears to be a possibility of the situation as regards getting machine tools, being considerably relieved. There is a growing belief in the American market that purchases of machine tools for shipment to England will in the future be of comparatively small proportions. It is believed that munition making plants of Great Britain are now capable of meeting all requirements; the demand for tools is, therefore, less urgent. In this event, machine tools will be easier to obtain for this market and deliveries will be better. It is understood that Russia is buying a large amount of equipment, not only lathes, but practically a general line of tools.

Supplies

A few price changes have to be noted this week. Solder is down 1c, due to the continued weakness in the tin market. Linseed oil market is very strong and prices have advanced 2c, the new quotation being 87c for raw and 90c for boiled, per gallon. Turpentine is 2c higher and is now quoted at 87c per gallon High-speed twist drills keep on advancing and the situation is such that it is impossible to give a firm quotation. Business continues very good, there being an active demand for supplies from shell plants.

Metals

The market is quiet this week and lower levels for tin and spelter have again to be noted, other metals being unchanged. Copper is quiet, although the market is in a strong position. The lead market is quiet but firm. There is no change in the antimony situation, and the aluminum market is featureless. There is a continued active demand for metals for munitions, but ordinarily business is quiet.

Tin.—Although the primary markets are firm, tin is weaker locally and has declined 2c. There is a fair demand, but stocks are accumulating, which may depress the market. Tin is quoted locally at 43c per pound.

Copper.—The market is in a strong position, although quiet and unchanged. There is apparently a lull in demand, both for domestic and export. "Lake Copper" is quoted at 20¾c per pound.

Spelter.—The market is in a very peculiar condition, and it is difficult to size up the situation. There is good inquiry but sellers are not showing much disposition to do business. Spelter has declined 2c locally and quotations are more or less nominal at 18c per pound. Zinc ore is quoted from $80 to $105, Joplin, Mo.

Lead.—The market is quiet but firm at the "Trust" equivalent of 5.25c New York. The ore is quoted at $70 to $73, Joplin, Mo. Lead is unchanged locally at 7c per pound.

Antimony.—Conditions in the antimony market are unchanged. Spot stocks are scarce but futures are being freely offered at a concession of about 2c less than the spot market. Local quotations are unchanged at 40c per pound.

Aluminum.—There is no change in the situation. Supplies are scarce and the demand continues heavy. Quotations are nominal at 65c per pound.

ALLIES PURCHASING AGENTS

The Trade and Commerce Department, Ottawa, has published the following list of purchasing agents for military purposes for the allied Governments:

International Purchasing Commission, India House, Kingsway, London, Eng.

French.—Hudson Bay Co., 56 McGill Street, Montreal; Captain Lafoulloux, Hotel Brevort, New York; Direction de l'Intendence Ministere de la Guerre, Bordeaux, France; M. De la Chaume, 28 Broadway, Westminster, London.

Russian.—Messrs. S. Ruperti and Alexsieff, care Military Atache, Russian Embassy, Washington, D.C.

CANADIAN EXPORTS TO GREAT BRITAIN

AN increase in imports from Canada of $34,697,000 and a decrease in exports to Canada of $20,498,000 during the first nine months of the present fiscal year is shown by figures for that period received by the Trade and Commerce Department from Commissioner Ray, of Birmingham. The total imports from Canada were $138,917,000, and exports to the Dominion $49,407,000.

Details are also furnished of the recent steps taken by the British authorities in respect to the requisitioning of all ships of British register, which regulations closely affect Canada. These show that rumors that the Government contemplates the requisitioning of the entire British mercantile marine are without foundation, but that power has been taken to deal, by the requisitioning of a sufficient number of vessels, with cases where an emergency of national importance exists at any particular market owing to the absence of tonnage, and, further, to regulate the employment of British shipping in the carriage of cargoes between foreign parts by means of licenses.

COMPENSATION ACT ADJUSTMENTS

A NUMBER of important changes in the grouping of industries under the Workmen's Compensation Act have been decided upon by the Workmen's Compensation Commission. The chief changes are a regrouping of the iron industries, in response to a request from employers; the separation of the manufacture of explosives from all other industries, and the uniting of all the building trades in one class. There has also been a rearrangement of railway, canal, roadmaking and bridgebuilding industries.

Theatres and moving picture houses, and the operation of elevators not in industries under Schedule 1, which had formerly been specifically included, are now excluded. The Board has also made the Act apply expressly to a number of industries hitherto considered to be covered by the general scope of the Act, but not expressly mentioned. The exclusion of machine shops, cabinet shops, and tinsmith shops with less than a specified number of employees has also been removed and exclusion from the schedule

is permitted in regard to certain wood operations carried on for the most part by farmers and settlers, and to repairing or small building operations carried on by owners of rented houses or buildings. The changes come into effect on January 1, and will not affect employers during the present year.

The Board announces that employers must send in their next pay roll statement by the 20th of January. In the meantime a circular explaining the changes in detail will be prepared for distribution, together with the pay roll form for the coming year.

DOMINION COAL CO. ST. LAWRENCE SEASON

THE quantity of coal transported to St. Lawrence ports by the Dominion Coal Co. during the 1915 season of navigation was about 1,600,000 gross tons. In addition to this, something over 100,000 tons will have to be handled through Portland over the ensuing winter months, making a total for St. Lawrence ports of 1,700,000 tons.

A slightly larger quantity was transported to Montreal during the 1914 season, but the difference is accounted for by the fact that steamers formerly taking large bunker supplies to St. Lawrence ports were diverted to Sydney in the season just past, and bunkered either on their inward or outward voyage.

Steamers employed in the coal-carrying trade made 310 trips to St. Lawrence ports during the season of navigation just ended, and vessels from the Upper Lakes, as well as the seven seas, were secured in order to carry this large amount of coal at a time notable for shortage of tonnage.

POWER DEVELOPMENT AT MUSKOKA

THE Hydro-Electric Power Commission of Ontario has under way the extension of a power plant on the south branch of the Muskoka River. This plant, located at South Falls, and formerly operated to supply the town of Gravenhurst, has a single unit with a capacity of 450 k.w. It is being enlarged by the addition of a 750 k.v.a. unit. Excavation work was recently commenced and most of the equipment has been ordered.

Provision was made in the design of the existing plant for such an extension, and the installation of the latter does not alter the previous arrangement.

A wood stave pipe line, 100 feet long, will connect the existing headworks with about 60 feet of steel penstock leading to the new unit. The headgate mechanism, steel penstock, turbine, governor and relief valves are all being supplied by the William Hamilton Co., of Peterborough, Ont., the generator and the transformers by the Canadian General Electric Co., Ltd., Peterborough, and the wood pipe line by the Pacific Coast Wood Stave Pipe Co. The latter is being laid by the commission. Orders for the switchboard equipment have not yet been placed.

The extended plant will supply the towns of Gravenhurst, Bracebridge and Huntsville.

NEW ELECTRIC STEEL FURNACE PLANT

THE Canadian Electro-Products Co., whose incorporation with a capital of $500,000 was announced recently, expects to have a new electric furnace plant for the manufacture of high-grade steel in operation in Montreal in about a month or six weeks. The plant is being designed on the basis of two units, each of a capacity of 25 tons of steel a day, and at least one of these units should be in operation within the time mentioned.

The authorized capital of $500,000, it is understood, will be half in preferred and half in common shares, but only a portion of the authorized amount will be necessary for the initial installation. Probably $100,000 will be required to equip the plant to start with, and this is being subscribed privately.

J. S. Norris, of the Montreal Light, Heat & Power Co. and Messrs. Howard Murray and Julian C. Smith, of the Shawinigan Water and Power Co., are among those behind the new venture and will be members of the board of directors when organization is completed. The company, however, is a private enterprise, and will not be a subsidiary of either Montreal Power or Shawinigan Power. However, as the operation of the new plant, when both units are working, will call for about 4,000 h.p., naturally both the older companies will benefit, one as the distributor and the other as the producer of the power required.

The new venture represents a further extension of the electric furnace idea, which is playing so large a part in the increased consumption of power in this province. It has been applied to the aluminum and carbide industries in the Shawinigan district on a large scale. As applied to steel on the lines proposed, it is a new proposition here, but similar plants are in operation at Welland and Sherbrooke.

CANADIAN PURCHASES FOR FRENCH WAR OFFICE

Philippe Roy, General Commissioner for Canada, Paris, advises the Department of Trade and Commerce, Ottawa, that an order has been issued by the War Department of the French Government to the effect that all purchases made by the Supply Branch in Canada will pass through the Hudson Bay Co. Canadian producers should therefore submit their future offers through the office of that company at Montreal. It is further stated in Mr. Roy's communication that Canadian lumber, steel and meat will find in France an important market for years to come, but it is necessary that Canadian firms should have in Paris representatives entrusted with the necessary authority, especially if it is desired to secure Government contracts.

DOMINION TRADE RETURNS

AN expanding revenue and a decreased expenditure on consolidated account are shown in the November financial statement of the Dominion issued on Dec. 10. The total revenue to the end of November was $104,756,305.25, as against $90,468,002.68 for the corresponding period of last year, increases appearing under all heads, with the exception of excise. The consolidated fund expenditure dropped from $75,708,627 to $65,345,503.

Expenditure on capital account outside of the war outlay also shows a substantial reduction. The 1914 column shows no war expenditure, but the outlay last month under this head is given as $13,155,797, bringing the capital expenditure on war for the fiscal period up to $66,514,955. The total capital expenditure to the end of November was $91,475,889, as against $28,231,933 for the same period last year. The gross debt increased by $202,225,076, and stood at $829,377,292 at the close of the month. The funded debt payable in Canada rose from $774,060 in November, 1914, to $8,725,450 in November, 1915. The funded debt payable in England increased from $329,020,000 to $342,703,302. Temporary loans rose from $20,573,333 to $165,007,017.

Increases in the sinking funds and miscellaneous and banking accounts brought the total assets of the Dominion up to $327,709,125, as against $262,308,968, the total net debt thus standing at $501,668,167, as compared with $364,843,247. The monthly increase in the net debt was $9,139,675, as against $12,167,848, a decrease of $3,028,175.

Stratford, Ont.—The directors of the People's Telephone Co. have decided to purchase the Forest plant of the Bell Telephone Co. It is expected that the change will be made at the commencement of the New Year.

ONTARIO MINERAL OUTPUT

RETURNS made to the Ontario Bureau of Mines for the nine months, ending September 30, 1915, show an increase in value of gold of $1,884,093, and a decrease in value of silves of $2,051,760. It is pointed out that the increase in the production of gold amounts to one-third.

The gold districts of Northern Ontario, the report says, are fulfilling the prediction made several years ago that they would make good the loss caused by the waning of the silver mines of Cobalt. Thus, the combined value of the gold and silver output of the first nine months of the present year was only $167,661 less than for the same portion of 1914, notwithstanding the fact that the yield of silver fell off over 20 per cent. Part of this decrease is due to the low prices which prevailed during the whole nine months, but which made a sharp recovery in November.

The Sudbury mines are being worked to the maximum capacity, and the production of nickel for the nine months nearly equals the largest previous output for a full year. Over 75 per cent. of the output is made by the Canadian Copper Co., but the operations of the Mond Co. are now more extensive than formerly, and its output has correspondingly increased.

The yield of copper was also much greater than in the corresponding period of 1914 and nearly equalled the total output of that year.

New Incorporations

The Montreal Steel & Foundry Co. has been incorporated at Ottawa, with a capital of $150,000, to manufacture all kinds of machinery and mechanical specialties, appliances and instruments, at Montreal, Que. Incorporators: Emilien Gadbois, Joseph Marechal Nantel, and Charles G. Derome, all of Montreal, Que.

The Barrymore Cloth Co. has been incorporated at Toronto, with a capital of $250,000, to take over as a going concern the cloth manufacturing portion of the business of the Toronto Manufacturing Co., of Toronto, Ont. Incorporators: Edmund Percival Brown and Wm John McWhinney, of Toronto.

The Wood Products Co. has been incorporated at Toronto, with a capital of $100,000, to engage in the destructive distillation of wood and to manufacture charcoal, wood alcohol and all other products. Head office at Toronto. Incorporators: Arthur Wellesley Holmestead and James Leith Ross, of Toronto.

The International Steel Corporation, Ltd., has been incorporated at Ottawa, with a capital of $100,000, to manufacture, produce and deal in iron, steel and all other metals, at Toronto. Incorporators: James Richardson Roaf, Wm. Graham and John E. Mordon, all of Toronto, Ont.

CANADIAN COMMERCIAL INTELLIGENCE SERVICE

The Department of Trade and Commerce invites correspondence from Canadian exporters or importers upon all trade matters. Canadian Trade Commissioners and Commercial Agents should be kept supplied with catalogues, price lists discount rates, etc., and the names and addresses of trade representatives by Canadian exporters. Catalogues should state whether prices are at factory point, f.o.b. at port of shipment, or, which is preferable, c.i.f. at foreign port.

Ottawa. R. Grigg, Commissioner of Commerce

CANADIAN TRADE COMMISSIONERS.

Argentine Republic.

H. R. Poussette, Reconquista, No. 46, Buenos Aires. Cable address, Canadian.

Australasia.

D. H. Ross, Stock Exchange Building, Melbourne. Cable address, Canadian.

British West Indies.

E. H. S. Flood, Bridgetown, Barbadoes, agent also for the Bermudas and British Guiana. Cable address, Canadian.

China.

J. W. Ross, 13 Nanking Road, Shanghai. Cable address, Cancoma.

Cuba.

Acting Trade Commissioner, Lonja del Comercio, Apartado 1290, Havana. Cable address, Cantracom.

France.

Phillipe Roy, Commissioner General, 17 and 19 Boulevard les Capucines, Paris. Cable address, Stadacona.

Japan.

G. B. Johnson, P.O. Box 109, Yokohama. Cable address, Canadian.

Holland.

Acting Trade Commissioner Zuidblaak, 26, Rotterdam. Cable address, Watermill.

Newfoundland.

W. B. Nicholson, Bank of Montreal Building, Water Street, St. John's. Cable address, Canadian.

New Zealand.

W. A. Beddoe, Union Buildings, Customs Street, Auckland. Cable address, Canadian.

South Africa.

W. J. Egan, Norwich Union Buildings, Cape Town. Cable address, Cantracom.

United Kingdom.

E. de B. Arnaud, Sun Building, Clare Street, Bristol. Cable address, Canadian.

J. E. Ray, Central House, Birmingham. Cable address, Canadian.

Acting Trade Commissioner, North British Building, East Parade, Leeds. Cable address, Canadian.

F. A. C. Bickerdike, Canada Chambers, 36 Spring Gardens, Manchester. Cable address, Cantracom.

J. Forsythe Smith, Fruit Trade Commissioner, Canada Chambers, 36 Spring Gardens, Manchester.

J. T. Lithgow, 87 Union Street, Glasgow, Scotland. Cable address, Contracom.

Harrison Watson, 73 Basinghall Street, London, E.C., England. Cable address, Sleighing, London.

SPECIAL TRADE COMMISSIONER—LUMBER.

H. R. McMillan, visiting Europe, Africa, Australasia and the Orient.

CANADIAN COMMERCIAL AGENTS.

British West Indies.

Edgar Tripp, Port of Spain, Trinidad. Cable address, Canadian.

R. H. Curry, Nassau, Bahamas.

Norway and Denmark.

C. E. Sontum, Grubbegod No. 4, Christiana, Norway. Cable address, Sontums.

South Africa.

D. M. McKibbin, Room 31, Permanent Buildings, Harrison Street, Johannesburg.

E. J. Wilkinson, Durban, P.O. Box 67, Durban, Natal.

CANADIAN HIGH COMMISSIONER'S OFFICE.

United Kingdom.

W. L. Griffith, Secretary, 17 Victoria Street, London, S.W., England.
Cable address, Dominion, London.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

Engineering

Glace Bay, N.S. The town council propose installing a pumping plant.

Hamilton, Ont.—The Monarch Machine Tool Co. will start work shortly on a war order.

Hamilton, Ont.—The Steel Co. of Canada, Ltd., will make considerable extensions to their plant.

Georgetown, Ont.—The Glass Garden Builders, Ltd., will erect a factory to cost about $25,000.

Montreal, Que.—The Williams Mfg. Co. will build a foundry at their plant on St. James street.

Hamilton, Ont.—The Dominion Steel Castings Co. will build an extension to their plant.

Bedford, Que.—A pumping plant will be installed in connection with the waterworks extensions now in progress.

Toronto, Ont.—The Board of Control will call for tenders for the supply and installation of a boiler at the municipal abattoir.

London, Ont.—The Battle Creek Toasted Corn Flake Co., Ont., will install electrical equipment to operate its machinery.

Halifax, N.S.—Work has been started on the erection of a steel plant for the Williston Steel & Foundry Co. Approximate cost, $16,000.

New Glasgow, N.S.—The Nova Scotia Steel & Coal Co. are building an addition to their steel plant at Sidney Mines, estimated to cost $100,000.

Fort Frances, Ont.—Russel Bros., machinists, have secured a contract for shells and will remove to Port Arthur where a plant will be equipped with the necessary machinery.

Edmonton, Alta.—G. W. Farrell & Co., of Montreal, Que., has signed a contract to supply power to the city. It will build a power plant and an electric railway to cost $6,000,000.

Arnprior, Ont.—The Galetta Power Co. are considering developing a water power at Long Rapids on the Madawaska river. A minimum of 13,000 h.p. could be developed at that point, but it would be difficult at present to dispose of so much power.

Quebec, Que.—Fire damaged the Eastern Canada Steed Co. plant, St. Malo, recently. The cause of the fire is not exactly known, but it is supposed that it originated through an explosion in the furnace room. The damage, which is said to be around $100,000, is covered by insurance.

Grimsby, Ont.—T. D. G. Bell and his associates have formed a new company to be known as Bells, Limited, for the purpose of making war munitions. The new company has rented the necessary space and plant from the Bell Fruit Farms, Ltd., and the new machinery to make munitions will be installed in a portion of the factory.

Montreal, Que.—The manufacture of steel billets will shortly be begun by Montreal Power-Shawinigan interests, who have purchased the Record Foundry Building, and are now installing the necessary equipment. The concern, known as the Canadian Electro-Products Co., has secured its charter and machinery, including an electric furnace.

Stratford, Ont.—At a meeting of the Finance Committee of the City Council on Dec. 5, a committee composed of Chairman Ald. Henry and Aldermen Forbes, Mantle and Pauli, was appointed to sell the machinery which is being cleaned out of the basement in the Kemp factory, to make room for the recruits to the 110th Batt.

Municipal

Collingwood, Ont.—The proposed by-law in connection with Wilson Bros. has been withdrawn.

Toronto, Ont.—The Board of Control has decided to submit the hydro-radial to the ratepayers on Jan. 1.

Windsor, Ont.—A by-law is being prepared to sanction the expropriation of the Windsor Gas Co.

Islington, Ont.—Etobicoke Township ratepayers will vote New Year's Day on the proposed system of Hydro-radials.

Petrolia, Ont.—A by-law in connection with the proposed sugar refinery will be submitted to the ratepayers on Jan. 3.

Berlin, Ont.—The city council have decided to submit the hydro-radial by-law to the electors at the January elections.

Chatham, Ont.—A by-law will be voted on by the ratepayers to sanction an expenditure of $10,000 on fire-fighting apparatus.

Chatham, Ont.—A by-law will be submitted to the ratepayers relative to granting concessions to the Dominion Sugar Co.

Baden, Ont.—The township council have decided to submit the hydro-radial by-law to the ratepayers of Wilmot Township on Jan. 3.

Chatham, Ont.—A by-law will be submitted to the ratepayers at the January elections regarding concessions to the Gray-Dart Automobile Co.

Sarnia, Ont.—A by-law will be voted on by the ratepayers on Jan. 3 to raise $120,000 for the purchase of the Sarnia Gas and Electric Light Co. plant.

Sarnia, Ont.—A by-law will be submitted to the ratepayers on Dec. 29 to authorize raising $12,000 to pay for waterworks extensions.

Tara, Ont.—A by-law will be submitted to the ratepayers on Jan. 3 to authorize an expenditure of $7,500 on a hydro-electric distribution plant.

Sherbrooke, Que.—The City Council contemplates alterations and improvements to the water power, electric transmission and lighting plants.

Listowel, Ont.—A by-law will be voted on by the ratepayers on Jan. 3, to authorize a loan of $12,000 to a company who propose to establish a boot factory here.

Cobden, Ont.—The town council will submit a by-law on December 27 to provide for the construction of a plant for the generation and distribution of power. Estimated cost, $20,000.

Princeville, Que.—The town council contemplates the erection of a pump station and the purchase of a 4-inch and 6-inch cast iron pipe, valves, pumps and hydrants.

Swift Current, Sask.—The City Council will engage an engineer to make a thorough examination of the pumping and waterworks system and advise as to what will be required to make the system thoroughly efficient.

Lindsay, Ont.—A by-law will be voted on at the January elections to authorize the granting of a loan of $15,000 to a

THE A. R. WILLIAMS MACHINERY CO., LTD.
ST. JOHN, N.B. TORONTO WINNIPEG VANCOUVER
Canada's Leading Machinery House

THE VALUE OF SERVICE RENDERED

is something we are rather proud of. Not content, however, with past achievements or length of service, we are fully prepared to satisfy all demands made upon us NOW. Your problem is our opportunity.

Particularly is this the case for Shell Machinery—whether for 6", 8", or 9.2"—we are ready to specify on complete layout and equipment.

Our Service Department for months past has been engaged in collecting, and have now assembled all the requisite data for manufacturing the new types of Heavy High Explosive Shells. We anticipated this and are therefore prepared to furnish any special type of machine, or complete equipment, for entire plants.

We guarantee Plants equipped and ready to manufacture in four to eight weeks after order is received.

The A. R. Williams Machinery Company, Limited
Toronto, Canada
IF IT'S MACHINERY—WRITE "WILLIAMS"

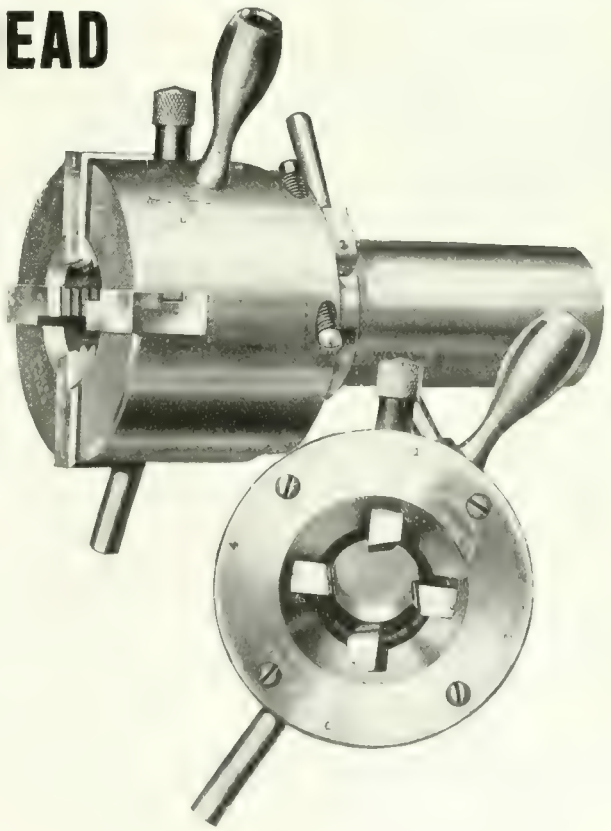
THE GEOMETRIC DIE HEAD

Has No Competitors

There are other Die Heads—Die Heads with some good features—but the Geometric has perfected every part, and is the monarch of the thread-cutting field.

Adapted to a Wide Range of Work

The construction of the dies and the method of holding them is such as to permit of instant adjustment or interchange of dies.
Right or left hand threads of standard or special pitch, also various special forms, are readily cut.



For Accurate, Rapid, Economical Threading Geometric Screw-Cutting Die Heads
cannot be excelled. Furnished by every turret lathe manufacturer in the country.
WRITE FOR THE CATALOGUE

THE GEOMETRIC TOOL COMPANY
NEW HAVEN, CONN.

Canadian Agents:
Williams & Wilson, Limited, Montreal
The A. R. Williams Machinery Company, Limited, Toronto, Winnipeg and St. John, N.B.

company who propose establishing a plant to manufacture wood alcohol, charcoal and acetic acid. Thomas Hodgson is promoting the company.

Toronto, Ont.—Parks Commissioner Chambers has recommended to Board of Control that three stand-pipes, the necessary quantity of fire hose, and three portable extinguishers be installed at the Process Building at the Exhibition grounds, where the soldiers are accommodated. The cost of the equipment will be $255.

Petrolea, Ont.—The council on Dec. 7 gave first and second readings to the by-law for $21,500 to assist the Western Sugar Refining Co., which will locate here, if this inducement is granted. A by-law to raise $25,000 to purchase stock in the company was twice read. These issues will be voted upon by the ratepayers January 3.

Electrical

St. Thomas, Ont.—The Michigan Central Railway will electrify their terminal at this place.

Hull, Que.—The city council are considering extensions to the lighting system, estimated to cost $20,000.

Biddulph Township, Ont.—A by-law has been passed providing for the installation of a hydro-electric system at an approximate cost of $3,500.

Burgessville, Ont.—A by-law to provide for the construction of a hydro-electric system at an approximate cost of $3,500 will shortly be submitted by the township council of South Norwich.

General Industrial

St. Catharines, Ont.—Fire on Dec. 7 destroyed the Maple Leaf Milling Co.'s flour mill here. The loss is estimated at $75,000, which is fully covered by insurance.

Davidson, Sask.—The Canadian Elevator Co. will build an extension to their elevator. The North Star Elevator Co. and the British American Elevator Co. will also enlarge their mills.

Vancouver, B.C.—The Canada Potash and Algin Co. will shortly work on a new plant for making iodine and gum algin. These materials will be made from kelp, which is found in large quantities along the coast.

Sackville, N.B.—The A. E. Wry Standard, Ltd., factory was damaged by fire on December 5, the loss being estimated at $35,000, of which $20,000 is covered by insurance. The company manufacture harness and other leather goods.

Toronto, Ont.—The factory of T. Crowley & Co., manufacturers of picture frames, on McDonnell Square, was badly damaged by fire on Dec. 12. The damage is placed at about $1,500 to the building and $7,000 to the stock and contents. The loss is covered by insurance.

Contracts Awarded

The Otis-Fensom Co., Hamilton, Ont., have been awarded a contract for an elevator by the Patterson Mfg. Co., of Montreal, Que.

Port Moody, B.C.—The contract for the construction of a waterworks system has been awarded to the Robertson-Godson Co., Vancouver, B.C., at $37,000.

Toronto, Ont.—The Board of Control has awarded a contract for the supply and installation of valves, steam piping, special steel castings and lagging at main pumping station to Purdy, Mansell, Ltd., at $19,995.

Brockville, Ont.—The Public Utilities Commission at a meeting on Dec. 7 awarded the contract for the new filtration plant to the Roberts Filtration Company, of Darby, Pa., for $86,000, and also requested the Town Council to provide $115,000 to cover the filtration plant, low lift pumps and intake cost.

Tenders

St. Hyacinthe, Que.—Tenders will be received up to January 11, for a mechanical filter plant. Plans and specifications may be obtained at the office of Hector Cadieux, city engineer.

Halifax, N. S.—Tenders will be received by the Governor of the Province of Macao, up till January 8, 1916, for the supply of a steel, self-propelling dredge for the use of the Macao Harbor Works. Full particulars may be obtained at the office of Fred H. Oxley, Consul for Portugal, Keith Bldg., Halifax, N.S.

Winnipeg, Man.—Tenders will be received up to Monday, December 27, 1915, for the supply of one saddle tank locomotive to the Greater Winnipeg Water Commission. Specifications and form of tender may be obtained and contract may be inspected at the offices of the district, 901 Boyd Building, Winnipeg, Man.

Winnipeg, Man.—Tenders addressed to the undersigned will be received up to Wednesday, December 29, 1915, for the supply of twenty twenty-yard automatic air-dump cars. Specifications and form of tender may be obtained and form of contract may be inspected at the office of the district. S. H. Reynolds, Chairman of the Greater Winnipeg Water Commissioners, 901 Boyd Building, Winnipeg, Man.

Trade Gossip

The Shawinigan Electro Metals Co. have increased the capital stock of the concern to $200,000.

The International Steel Corporation, Ltd, have changed the name of the concern to Canadian Iron Ores, Ltd.

The Turnbull Elevator Co., Toronto, have been awarded a contract for the elevators for the Crompton Corset Co.'s new warehouse.

Simcoe, Ont.—The Town Council will submit a by-law for the establishment of a Utilities Commission to take over the waterworks sewage disposal plant and the hydro system.

The Canada Steamship Line, Montreal staff have enlisted for overseas service. The eligible men are to be enlisted in one battalion, and officers, who are to go to Halifax at once to qualify for commissions, will lead the company. There are forty-six Canada Steamship Line in the trenches now.

Kingston, Ont.—The announcement of United States Consul F. F. Johnson last Monday shows the export trade from this port to the States for the year 1915 to have reached the million dollar mark, giving Kingston third place in the Dominion, with Toronto first and Ottawa second.

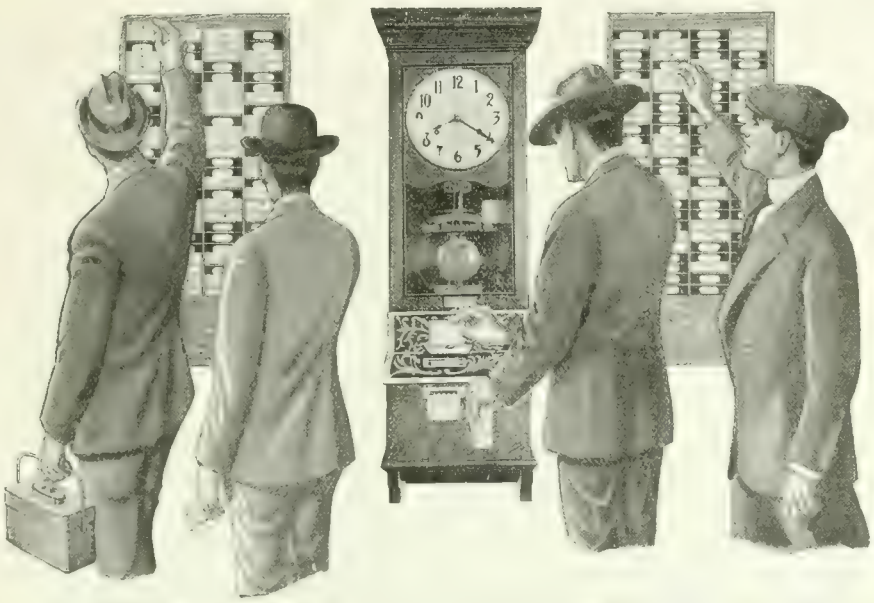
Toronto, Ont.—It is reported from La Porte, Ind., that the plants of the M. Rumley Co., and Rumley Products Co., capitalized at $32,000,000, were bought in at receiver's sale for $4,000,000 on Dec. 9 by reorganized Rumley companies. The Rumley Co. have a branch in this city.

Toronto, Ont.—Roads to the extent of 250 miles have been permanently improved and macadamized in various parts of the Province of Ontario this year. On colonization roads $220,078.19 has been spent. The total cost of the Hamilton-Toronto highway will be about $900,000. The estimated cost was $600,000.

Montreal, Que.—The shareholders of the Canada Cement Company, at a special meeting recently unanimously authorized an application for supplementary letters patent permitting the company to embark on the manufacture of war munitions. General Manager Jones gave an optimistic forecast of the results expected from the business, and the shareholders were informed that no new financing would be necessary.

Montreal, Que.—Three departments of the Grand Trunk Railway shops at Point St. Charles were gutted by fire which broke out at noon on Dec. 10 in the tube

Business is good—it is good with us



We are the largest makers of Time Recording and Cost Systems in the world. It costs nothing to get our advice. Write us for our latest illustrated price lists

That means it is good over the rest of the country, because International Time Recorders are only used to check *working time.*

What else indicates that business is good?

Labor is in big demand.

Our exports largely exceed the imports.

Farmers have had good crops.

Stocks of manufactured goods are low.

Factories are busy; many working overtime; many working day and night.

More freight cars are needed and the steamship lines are taxed to capacity and earning big profits.

There is more money in circulation amongst more people than ever before.

Can you beat that combination? These are facts.

The more prosperous we become the more need to stop the waste and the leaks. There are millions and millions of dollars being paid out every week on the automatically-correct International Time Recording Systems. Amongst other advantages, our records furnish the original payroll — always legible, positive and beyond dispute.

International Time Recording Co. of Canada, Limited

Ryrie Bldg., Corner Shuter and Yonge Streets, TORONTO

F. E. MUTTON,
General Manager

Montreal Representative: CHARLES COLE
Cartier Bldg., McGill and Notre Dame Sts., Montreal, Que.

A Big Business

finds it necessary to advertise. Steel Corporations, Railways, Shipping Companies, Municipalities, Provincial Governments, and in fact all concerns of magnitude.

If this is so, where the ramifications of an industry or corporation or other interests extend over a continent, across the seas and perhaps throughout the world, then there must be a basis of logic in it for those whose business is of limited dimensions.

Steady publicity is bound to make an impression—provided the means and methods employed are correct.

We have the medium and can advise you about methods—write

CANADIAN MACHINERY

143-153 University Ave. - - TORONTO

Where a belt is subjected to extreme conditions of

LEVIATHAN AND ANACONDA ELEVATING TRANSMITTING CONVEYING BELTING

DUST, HEAT, ACID, MOISTURE

the durability of Leviathan-Anaconda belts, combined with their lower cost, places them in a class apart.

Let us help you solve your belting problems.

Main Belting Co. of Canada Limited

10½ St. Peter St., - MONTREAL

shop and spread to the blacksmith shop and the erecting plant. The fire was caused by a tube striking and breaking an oil pipe, the oil igniting and flowing in all directions. The tube shop, blacksmith shop and part of the erecting shop were destroyed.

Toronto Harbor Works.—It is announced that the Toronto harbor work in the vicinity of Cherry Street is to proceed as weather permits. The Canadian Stewart Co., the contractors, have undertaken to make good the defective construction by a sub-contractor disclosed upon examination by Government experts, and the work will proceed without further hitch in favorable weather. The restoration of the imperfect construction will be done without cost to the Government, it is said. The contractors say there will be no unnecessary delay.

Grain Moving on N. T. R. Arrangements have now been completed for the official inspection, weighing and grading of grain at Winnipeg so that grain consigned by the N. T. R. will not have to go first to Fort William or Port Arthur. At present all certificates are granted at the head of the lakes. At Halifax, where most of the grain handled will be shipped, Mr. Cochrane has made arrangements for the storage of some five hundred cars, so that the grain will be protected until shipped. There is no elevator accommodation at Halifax. The Government expects to get a large share of the winter all-rail shipments.

National Steel Car Co.—In a letter to the shareholders, Vice-President Basil Magor states that the company has orders aggregating $8,000,000 for rolling stock to be used on foreign railways, as well as other large contracts, and in addition the company is building steel sleeping coaches, first-class coaches and motor trucks. Mr. Magor states that the fiscal year ending on November 30 will show approximately $450,000 of profits, and that, therefore, if the dividend liability is removed without depleting too much the working capital, the company's position will be substantially improved.

Personal

Frederick Powell, president of the Rideau Lumber Co., Ottawa, Ont., died on December 3.

W. G. Worden, a graduate of Toronto University, has been appointed town engineer of Oshawa, Ont., to succeed F. A. Chappell, who has resigned.

E. M. Smith, president of the American Shipbuilding Co., who owns the dry dock at Port Arthur, Ont., died suddenly at Buffalo, N.Y., on Dec. 8.

A. G. McAvity, manager of the Canadian Blower & Forge Co., Berlin, Ont., has been engaged by the Imperial Munitions Board in an advisory capacity.

Lieut. F. Y. Harcourt, who for several years has been district harbor engineer at Port Arthur, Ont., has received a commission in the 94th Battalion of the C.E.F.

W. L. Helliwell, manager of the Gurney Northwest Foundry Co., Winnipeg, Man., has been appointed to a more important position on the staff of the firm at the head office in Montreal.

Thomas J .Walsh, chief operating engineer of the high-level pumping station, Toronto, Ont., who had been in the civic service for a long number of years, died on Dec. 12 at his home, 40 Rathnally Avenue, in his 55th year.

H .S. Carmichatel has been appointed freight and passenger agent at London, England, of the Canadian Pacific Ocean Services. He completes twenty years' service with the C. P. R. this week. H. S. Dring succeeds him as passenger agent of the C. P. R.

L. C. Ord, assistant works manager, Angus car shops, C. P. R., Montreal, Que., has been appointed Lieutenant in No. 1 Overseas Battery of the Siege Artillery, C.E.F., and has been granted leave of absence for active service. Lieutenant Ord sailed from Halifax for the front November 22nd.

F. Perry has been appointed a member of the Imperial Munitions Board. Mr. Perry has for some years represented in Canada a large private banking house of London. At one time he was attached to the British Colonial Office, and later was Imperial secretary to Lord Milner in South Africa and chairman of a native labor association in South Africa.

New Incorporations

The York Paper Box Co. has been incorporated at Toronto, with a capital of $40,000, to manufacture all kinds of paper boxes, etc., at Toronto. Incorporators: James Douglas Woods and William Batten McPherson, of Toronto.

The Chemical Refinery, Ltd., has been incorporated at Ottawa, with a capital of $100,000, to manufacture drugs, chemicals and fertilizers at St. Catharines, Ont. Incorporators: John P. Mitchell, Harry W. Page and W. P. Crow, all of Toronto.

The J. S. Lewis & Sons, Ltd., has been incorporated at Ottawa, with a capital of $100,000, to carry on the business of lumbering and manufacturing of wood and other materials at Truro, N.S. Incorporators: George Ezra Morton Lewis and Frank Leslie Lewis, of Truro, N.S.

Railways – Bridges

Brantford, Ont.—It is understood that arrangements are practically completed for the creation of a Union Radial Station in this city to be used jointly by the Brantford and Hamilton and Lake Erie and Northern Railways. The intention is to place it on the old site of the Brantford Ice Co., and it will cost approximately $30,000.

Berlin, Ont.—By a vote of eight to four the City Council decided on Dec. 6 to submit a hydro-radial by-law for $779,000 to the ratepayers. Waterloo Town and Waterloo Township Councils also voted in favor of submitting similar by-laws, the former for $193,000, and the latter for $521,903. Engineer F. A. Gaby, of the Ontario Hydro-Electric Commission, attended all three meetings. The route through Berlin agreed upon by the citizens was not defined in the by-law.

Building Notes

Toronto, Ont.—A building permit has been issued to W. H. Harris, in trust, for the erection of a two-storey brick mill construction warehouse on the north side of Richmond Street, near John Street, costing $18,000.

Wood-Working

Calgary, Alta.—The Rumley Co. propose building a warehouse here and make the city a distributing centre.

Hamilton, Ont.—Spontaneous combustion started a blaze in the Semmens & Evel casket factory on December 7, and did $2,000 damage.

Deseronto, Ont.—The Canada Hardwood Mfg. Co. is in the market for sawmill and wood-working machinery, auto-

Marine

Port Arthur, Ont.—The Western Dry Dock & Shipbuilding Co.'s plant will be working to capacity during the coming winter months. The company have on hand several freighters for lake service.

Port Arthur, Ont.—Freight rates from Port Arthur to Buffalo have risen from a rate of from three and a half to four cents a bushel, which prevailed during the regular season, to five and a half cents.

North Vancouver, B.C.—The City Council will immediately take steps to offer some inducements for the establishment of a drydock on the North Shore. The Board of Trade will support the scheme.

John L. Nelson, who came to the Province of British Columbia in March, 1913, as superintendent of dredging, has sent in his resignation to the Department of Public Works.

Port Arthur, Ont.—The Canadian steamer, W. Grant Morden, the longest boat on the lakes, left on Dec. 9 for Port McNicoll with 760,000 bushels of oats, the largest cargo ever taken from this port, being equivalent to 400 loaded cars.

Brockville, Ont.—The Department of Marine and Fisheries has awarded the contract for the erection of a lighthouse one the river front at Fulford's Point, west of here. The building will be twenty feet high with concrete foundation.

Collingwood, Ont.—The steamer Hamonic of the Northern Navigation Co.'s Lake Superior fleet is coming to Collingwood about Dec. 15th and will probably remain throughout the winter. The object of the visit is to go to the dry dock for repairs.

Catalogues

Milling Machines.—A bulletin issued by the Fox Machine Co., Grand Rapids, Mich., describes and illustrates the "Fox" No. 3 hand and power feed milling machine. A specification is included giving the principal dimensions and shipping weights, etc.

Air Heater and Air Blower.—Bulletin No. 219, issued by the B. F. Sturtevant Co., Boston, Mass., deals with the "Sturtevant" electric air heater and blower. The apparatus is fully described and the various purposes for which it can be used are given in detail. A list of sizes with capacities is included and the illustrations show a few different types indicating their varied application.

Friction Clutches made by the Carlyle, Johnson Machine Co., Manchester, Conn., are illustrated and described in catalogue E, recently issued. The various classes of work for which this clutch is suitable are described separately with illustrations showing the mountings. Tables are included giving the principal dimensions, accompanied by diagrams showing to what part the dimensions refer. Other equipment for use with these clutches is also described and illustrated.

Oxy-Acetylene Apparatus.—The L'Air Liquide Society of Montreal, Que., have issued a folder containing a number of leaflets describing their oxy-acetylene apparatus for welding and cutting. The many types of blowpipes for various purposes are described fully and tables give the capacity for each size. Other leaflets describe and illustrate acetylene generators. A number of welding supplies and materials are dealt with in detail, accompanied by price lists. The leaflets are fully illustrated and included in views of the plants at work.

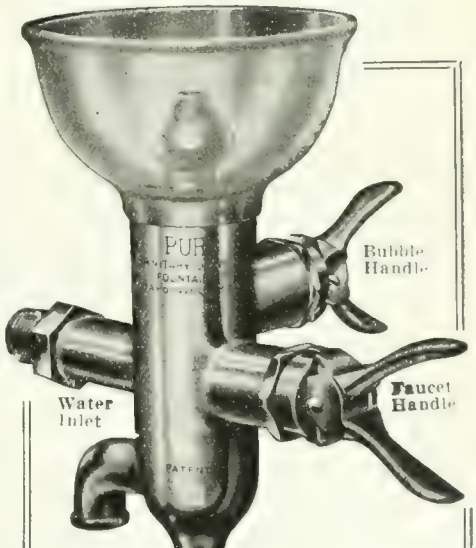
The Phenix Force Feed Lubricator, Bulletin No. 50, recently issued by the Richardson-Phenix Co. of Milwaukee, Wis., contains a complete description of the Phenix ratchet type lubricator; it also describes a new type, known as the model "T." The catalogue contains an interesting diagram, giving a comparison of the way in which mechanical and hydrostatic lubricators feed oil to engine cylinders. Numerous illustrations show the application of the Phenix lubricator to different types of engines, pumps, steam hammers, etc.

Establishing and Maintaining Boiler Room Economy is the title of a paper presented before the Ohio Society of Mechanical, Electrical and Steam Engineers, by Geo. H. Gibson, developing the thesis that the most important requisites to further improvements of boiler plant economy are means of recording boiler performance—that is, of determining the number of pounds of water evaporated per pound of coal. Information obtained sporadically, as by means of short boiler tests, is not so suitable for this purpose as is information supplied continuously, as by a feed water meter. The relative values of different kinds of coal, the improvement in evaporation following cleaning of soot and scale off heating surfaces, or the stopping up of air leaks, the relative merits of different methods of firing, are then readily demonstrated, and scientific management becomes easy and natural. That is, the ways and means of attaining a certain standard of performance having been demonstrated, the management is in a position to ask for good results continuously; in fact, standard rules of operation—that is, directions as to methods of handling fires, regulation of draft, blowing of soot, banking fires, carrying over-loads, etc., can be written out, so that any man following instructions can obtain good results. The installation further arouses the pride of the engineer, and makes it possible to reward skill or attention to duty. This pamphlet is being distributed by the Harrison Safety Boiler Works, Philadelphia, Pa.

PATENTS
FETHERSTONHAUGH & CO.
THE OLD ESTABLISHED FIRM
5 ELGIN ST OTTAWA
ROYAL BANK BLG TORONTO
SEND FOR PLAIN PRACTICAL POINTERS
& COPY NATIONAL PROGRESS IN WHICH
ALL OUR PATENTS ARE ADVERTISED

PATENTS
PROMPTLY SECURED
In all countries. Ask for our Inventor's Adviser, which will be sent free.
MARION & MARION, 364 University St
Merchants Bank Building, corner St. Catherine St., MONTREAL, Phone Up. 6474
and Washington, D.C., U.S.A.

I BELIEVE
In Safety First and always.
In providing for the Health of my Fellow Workmen.
In Light and Air and Sanitary Working Conditions.
In clean, fresh drinking water for everybody.
In the Safety, Economy and Man-betterment of the
PURO SANITARY DRINKING FOUNTAIN CO
(MADE IN CANADA)



"PURO-FY"
YOUR WATER SUPPLY
Puro Sanitary Drinking Fountain Company
147 University Ave., Toronto, Canada

CLASSIFIED MACHINERY LIST

WANTED

Eight Gisholt 24" Turret Lathes. Re-manufactured machines with complete standard equipment as supplied by the makers.

Must be guaranteed in first-class working order. Cash will be paid immediately for above.

Box 159, Canadian Machinery.

Classified Advertisements

Rates (payable in advance):—2c per word first insertion, 1c per word subsequent insertion. 5c additional each insertion when Box Number is required. Each figure counts as one word

WANTED

WANTED—POSITION AS BRASS FOUNDRY foreman. Advertiser has had past experience in high class valves and plumber supplies, also foundry end of shell work. Can furnish the best of references. H. W. B., care of Canadian Machinery, Montreal.

FOR SALE

FOR SALE FIFTEEN-HUNDRED GALLON Duplex Steam Pump, used sixty days. Size twenty x twelve x sixteen stroke. Apply Fraser & Chalmers of Canada, Limited, Montreal. (2C)

STEAM ENGINES FOR SALE—ONE 10 H.P. stationary boiler and settings complete; good working order. Price one hundred dollars. One 3 to 4 H.P. upright; good working order. Price fifty dollars. Apply to H. A. Lawrence, West Shefford, Quebec.

FOR SALE—INGERSOLL-RAND CASE NE 1 power-driven, single-stage, straight line air compressor, close connected for belt drive to motor. Piston diameter 12 inches. Piston displacement 258 cubic feet per minute. Designed for pressure, minimum 35, maximum 55, lbs. per square inch. Length 7' 6". Width 3'. Height 4' 3". Been used for 4 weeks only. Box 160, Canadian Machinery. (8)

FOR SALE

14 x 6 Prentice Bros. Lathe, all Geared Head.
No. 6 Brown & Sharpe Plain Screw Machine, Back Geared.
16 in. Davis & Egan Screw Machine, Back Geared, Friction Head.
30 in. Lodge & Shipley Pulley Lathe with Turret, 4" Hollow Spindle.

American Machinery Exchange
217 Centre St., New York City

Machinery For Sale

1—Automatic Gridley, 1¼ capacity.
1—16" shaper with countershaft and swivel vise.
1—New 4-spindle "Reed Prentiss" Ball-Bearing Drill Press.
4—Electric Direct Current Breast Drills, up to ¾ capacity.
1—3-Ton Screw Pulley Chain Block.
4—5-Ton Screw Pulley Chain Blocks.
2—4-Ton Screw Pulley Chain Blocks.

Ontario Metal Products Co.
Limited
102 FRONT ST. EAST, TORONTO

SOME GOOD ONES

TURRET LATHES

Gisholt, 21" Motor Drive
Garvin, 20", Back Geared
Niles, 24", Back Geared
P. & J., 8½ x 16 Automatic, A1
Warner & Swasey No. 2, Hollow Hexagon

ENGINE LATHES

Schumacher & Boye, 20 x 12
Greaves & Klusman, 18 x 12
Fifield, 42" x 20', T G
Lodge & Shipley, 18 x 8, Patent Head
Lodge & Shipley, 24 x 10, Patent Head
Bradford, 18 x 8, with taper
Bradford, 18 x 6, with taper
Schumacher & Boye, 20 x 10 with taper
New Haven, 32 x 16
Flather, 14 x 6, Quick Change Gear
Fairbanks, 14 x 6, with taper
Reed, 14 x 6, C R
Lodge & Barker, 18 x 8
McCabe, 24" 40" x 12" Double Spindle
Hamilton, 26 x 16
Walcott, 36 x 16
New Haven, 25 x 16
Schumacher & Boye, 18 x 18, Triple Geared

GRINDERS

Landis No. 1 Universal
Landis No. 2, Universal
Bath No. 1 Universal
Walker No. 2 Tool Room
Brown & Sharpe No. 1 Universal

MILLING MACHINES

Brown & Sharpe No. 1 Y-Plain
Becker No. 1 Vertical with rotary

Garvin No. 1½ Universal
Brown & Sharpe No. 2 Plain
Kempsmith No. 1½ Universal
Becker No. 7 Lincoln
Cincinnati No. 4 Plain
Cincinnati No. 3 Plain
Garvin No. 15 Plain
Fox No. 0 Hand and Power
Cincinnati No. 1½ Plain

PLANERS

Gray 62 x 54 x 12 two heads
Belmez, 36 x 48 x 8, one head
New Haven, 42 x 42 x 12, one head
Detrick & Harvey, 42 x 42 x 14, open side
Cincinnati, 30 x 36 x 14 four heads
Wheeler, 28 x 28 x 8
Pond, 24 x 26 x 8
Pond, 24 x 24 x 6
Hamilton 24 x 24 x 6
Gray 24 x 24 x 7
Gray, 24 x 24 x 6
Gleason, 36 x 36 x 8
Pond, 44 x 44 x 12
Pulteam 40 x 38 x 14
Morton Portable
Whitcomb, 17 x 17 x 12, Chain
New Haven 24 x 24 x 8

SCREW MACHINES

Brown & Sharpe No. 6, Wire Feed
Brown & Sharpe No. 1, Inverted Tool
Brown & Sharpe No. 2, Automatic
Cleveland, ⅞", Automatic
Cleveland, ¾", Automatic
Cleveland, ¾" Automatic Turret Feeder

2 Cleveland, 2¼", Automatics
Hartford, ¾", Automatic Stud
Hartford, 1 3/16", Automatic
Cleveland, 2" Automatic Cherkan

BORING MILLS

Colburn, 60", two swivel heads
King, 42", two swivel heads
Bullard, 42", one swivel and one turret head
Colburn, 42", two swivel heads and center boring head
Niles, 50", Pulley Borer
Niles, 52", Car Wheel Borer

SHAPERS

American 24", B. G. Crank
Davis & Egan, 24"
Walcott, 32", Triple Geared
Putnam, 26", Triple Geared
Barker, 18", Crank
American 16", Crank
Hendey 17" Friction
Walcott 16" Crank
Platt & Whitney, 14" Crank

RADIAL DRILLS

Dreses 5' Universal
Western 5' Universal
Bickford 5', speed box
Bickford 4' cone drive
American 3½', cone drive
Foslick 2½', national pattern
Universal 3', cone drive
Parish 4', suspended
Industrial 3½', plain

The H. A. Stocker Machinery Company, 566-572 W. Randolph St., CHICAGO, ILL.

USED MACHINERY

FOR IMMEDIATE DELIVERY

MISCELLANEOUS

No. 2 Hulbut-Rogers Cutting Off Machine
Style D Matson Cutting Off Machine
No. 3 Cincinnati Gear Cutter
Wilmarth-Marmon Drill Grinder
2 H.P. 220 volt D.C. Polishing Lathe
No. 60 Heald Cylinder Grinder
Lincoln Miller (old style)
10-20-25-30-35 H.P. 220 volt, A.C. Motors
No. 1 American Oil Extractor
No. 200 Oil Extractor
30 x 30 x 8 Gray Planer No. 90
24 x 24 x 8 Gray Planer
22" Triple Geared Shaper No. 46
No. 1 Grenier Riveting Machine

BORING MACHINES

2 Spindle Newton Horizontal Cylinder Boring Machine
42" Bullard Vertical Boring Mill with two heads

DRILL PRESSES

26" Barnes sliding head
28" Prentiss sliding head
22" Barnes wheel and lever feed
22" Kerkhoff lever feed
14" 2-spindle Rockford
4 ft. Niles Plain Radial
4-Spindle Gardam Adj. gang
23" Hoefer with tapping attach.
3-Spindle Barr (2)
2-Spindle Reed (10)
3-Spindle Reed
4-Spindle Reed (4)

LATHES

2 x 24 Jones & Lamson (old style)
16 x 6 Porter (plain rest)
18 x 8 Putnam (plain rest)
18 x 12 Blaisdell with turret
18 x 6—1½ hole c.p. f. turret
18 x 8 Lodge & Shipley
18 x 8 Davis & Egan with turret
18 x 10 American (tool room)
20 x 10 Lodge & Shipley
22 x 12 New Haven
18" x 8' Lodge & Shipley No. 60
18" x 16' Lodge & Davis No. 53
16" x 8' Lodge & Davis No. 37
18" x 8' Lodge & Davis No. 50
20" x 10' Putnam with grinding attachment No. 52
26" x 30' Special Shafting Lathe No. 83

VONNEGUT MACHINERY CO.
47 South Meridian St., Indianapolis, Ind.

FOR SALE

10 H.P. St. Marys Gas Engine. Attachments for crude or kerosene oil. Gasometer, magneto and air tank outfit complete. Second hand, but in first-class condition.

For price write to

The Canadian Winkley Co., Ltd.
WINDSOR, ONTARIO

For Sale

Second-Hand Steel Tiering Machine, operated by hand.

By the use of this machine one man may lift as high as the ceiling, if necessary, heavy boxes, bales, rolls, etc.

This machine is in first-class condition, and is offered at a sacrifice.

Box 157
Canadian Machinery

PETRIE'S
WEEKLY LIST
Of New and Used Machine Tools in Stock for Immediate Delivery

Turret Lathes and Screw Machines

40" x 12' New Haven
26" x 8' Davis
20" x 10' American
20" x 6' Bridgeport
18" x 8' Prentice (4)
15" x 5½' fox, American
13" x 5' Woods tilted turret
12" x 4½' Woods tilted turret
2" x 24" Jones & Lamson flat turret
No. 2 Garvin (2)
No. 1 Pratt & Whitney
No. 3 Bardons & Oliver
⅞" Cleveland automatic
¾" Cleveland automatic
8" x 31" Brown & Sharpe
6" x 28" Brown & Sharpe (3)
Garvin double turret

Engine Lathes

42" x 20' Fifield
30" x 12' Putnam
30" x 10½' Pond
26" x 14' McDougall (gap)
26" x 14' Gleason (3)
25" x 16' Niles
25" x 10' Bradford
24" x 24' Fifield
24" x 12' Draper
20" x 10' Powell
20" x 8' Fitchburg
20" x 8' Bullard
20" x 8' Ames
20" x 8' Herrington
18" x 6' Lodge & Davis
18" x 6' Ames
17" x 8' Blaisdell
16" x 10' Cincinnati
16" x 6' Lodge & Davis
15" x 5' Flather

Upright Drills

26" Bickford (2)
26" back-geared, sliding head
24" Kern
20" Buffalo
20" Bertram
20" Bickford
20" Barnes
14" Garvin, 4-spindle
84" Bertram universal radial
72" Bertram universal radial
64" Wall radial

Planers and Shapers

52" x 50" x 11' Pond
30" x 30" x 17' Wheeler
30" x 30" x 16' Putnam (2 heads)
30" x 30" x 8' Bertram
25" x 25" x 12' Lodge & Davis
24" x 24" x 6' Butler
10" x 24" Fitchburg traverse
20" Smith & Mills
24" Hendey
20" Barker
16" Garvin

Milling Machines

No. 2 Kempsmith universal
No. 4 Brown & Sharpe universal
No. 12 Brown & Sharpe plain (2)
No. 3 Cincinnati plain
84" Bertram slab miller.

Presses

No. 4½ Bliss
No. 5 Waterbury
No. 4 Sarnia
No. 52 Ferracute

Miscellaneous

No. 1 Racine back saw (4)
14-26 Besly grinder
52" x 9' special facing and tapping machine
No. 1 Dwight Slate gear cutter
6 Brown, Boggs power shear
300-lb. Bertram steam hammer
1½" Bertram bolt cutter
1⅛" Standard bolt cutter

Prices, Descriptions and Full Particulars on Request

H. W. PETRIE, LTD.
Front St. W. - Toronto, Ont.

IMMEDIATE DELIVERY

WE CALL ATTENTION TO THE FOLLOWING TOOLS, ALL OF WHICH ARE IN THOROUGHLY FIRST-CLASS CONDITION. READY FOR IMMEDIATE SERVICE

BORING MILLS.

72 inch King vertical boring and turning mill, with two heads.
72 inch Niles vertical boring and turning mill, with two heads

TURRET LATHES.

One Garvin No. 3 turret Lathe, 18" swing, with 2⅛" hole through spindle, back geared and friction head.
One Garvin No. 2½ turret lathe, 16" swing, 1½" hole through spindle, back geared and friction head.
One American Tool Works Co. turret lathe, 18" swing with 3" hole through spindle, equipped with back gear, friction head.
One Pratt & Whitney No. 3 turret lathe, 14" swing, 1¼" hole through spindle, back geared and friction head.
One No. 3 Pratt & Whitney screw machine, 14" swing, 1" hole through spindle, with wire feed attachment, plain head.
One Davis & Egan No. 3 screw machine, 12" swing with 1" hole through spindle, complete with wire feed, plain head.
One Garvin wire feed screw machine, 12" swing with 1" wire feed capacity, plain head.
One Warner & Swasey plain head turret lathe, 14" swing with 1" spindle capacity
One Windsor plain head turret lathe, 14" swing with 1" spindle capacity
One 16" x 5' Gage Fox Monitor brass turning lathe, back gears

Girard Machine and Tool Co.
491-493 N. Third Street, Philadelphia, Pa.

MACHINE TOOLS

FOR QUICK SHIPMENT

EACH MACHINE CAREFULLY REMANUFACTURED IN OUR OWN SHOP, TESTED AND GUARANTEED

ENGINE LATHES

1 11" x 5' Rockford
1 12" x 6' American
2 14" x 6' Flather
1—14" x 6' Morris
2 14" x 6' Pratt & Whitney
1—14" x 6' American
1—14" x 6' Walcott
1 14" x 6' LeBlond
2—15" x 6' Blaisdell
1—15" x 6' LeBlond
1—15" x 6' Davis
1 15" x 6' Walcott
1—15" x 8' Flather
1—16" x 6' Reed
1—16" x 8' Lodge & Shipley
1—16" x 8' Von Wyck
1—16" x 8' Flather
1—16" x 8' Monarch
1 16" x 8' LeBlond
1—16" x 10' Lodge & Shipley
1—16" x 14' American
1 17" x 6' LeBlond
1 17" x 8' LeBlond
1—17" x 10' LeBlond
1 18" x 6' Schumacher & Boye
1 18" x 8' Hendey
2 18" x 8' American
1—18" x 8' Davis
1—18" x 8' Lodge & Shipley
2—18" x 10' Bradford
1 18" x 10' Davis
1 18" x 14' New Haven
1 19" x 10' LeBlond
1—19" x 10' Rahn
1—19" x 12' Lodge & Davis
1 20" x 8' American
1—20" x 10' American
1—20" x 12' Flather
1 21" x 8' Schumacher & Boye
1—21" LeBlond Heavy Duty
1—21" x 12' LeBlond
1—21" x 12' Bradford
1 22" x 12' Greaves & Klusman
1 24" x 10' New Haven
1 24" x 12' Blaisdell
1 25" x 10' American
1 26" x 10' Greaves & Klusman
1—26" x 12' Davis
1—27" x 14' Lodge & Shipley
1—32" x 16' Walcott
1 40" x 16' Gleason
1 42" x 12' Putnam
1 45" x 18' New Haven
1 60" x 16½' Fitchburg

HAND TURRET MACHINES

1 15" x 5½' American Fox
2 15" Dreses Friction Monitors
1 16" Warner & Swasey
2 No. 4 Warner & Swasey
1—18" x 6' Lodge & Davis
1 18" x 6' Springfield
1 36" Eddy
1—1" Costello
4—No. 2 Pratt & Whitney
1—No. 2½ Pratt & Whitney
1—¾" Wood Turret
1—1" Bardon's & Oliver
1 1" Wood Turret
1 1½" American
1 Garvin
2—2" x 24" J. & L. Cone
1 2" x 24" J. & L. Geared
1—3" x 36" J. & L. Geared

VERTICAL BORING MACHINES

8—20" Baker Bros.
2 24" Bickford
3—Foot Burt 2-spindle
2 Foot Burt 4-spindle
1 30" Baush
4—34" Bullard
1 34" Rogers
1 37" Baush & Harris
1 40" Bullard
1—41" Bullard
1—42" King
1 42" Gisholt
1—44" King
1 54" Colburn

HORIZONTAL BORING MACHINES

12 No. 1 2-spindle Pratt & Whitney Rifle Barrel Drillers
1 Flather
1 No. 1 Niles
1 Newark
4 Bement
3 Binsse
1 Bement, Miles & Co.
2—Beaman & Smith
1 Sellers
1—Betts

MILLERS

2 No. 0 Brown & Sharpe
1—No. 0 Owen
2 No. 0 Cincinnati
1 No. 15 Garvin
1 No. 25 Brainard
2 No. 20 Oesterlein
1 No. 13½ Garvin
1 No. 2-Y Brown & Sharpe
1 No. 2-B Brown & Sharpe
1 No. 2-H Brown & Sharpe
2 No. 2 Cincinnati
2 No. 3 Becker Brainard
1 No. 28 Oesterlein
1—No. 34 Oesterlein
3 No. 9 Kempsmith
1 No. 3 Kempsmith
2 No. 5 Kempsmith

LINCOLN MILLERS

5—No. 2 Pratt & Whitney
7—No. 12 Pratt & Whitney
7—No. 13 Pratt & Whitney
2 No. 5 Hendey
5 No. 6 Becker Brainard
2 No. 7 Brainard
2 Brown & Sharpe
4 No. 7 Becker
2—36" Chicago
1—No. 2 Newton
1—No. 4 Newton
3—Carter & Hakes
10—Miscellaneous

PLANERS

1 24" x 24" x 6' Davis & Egan
1 24" x 24" x 6' Whitcomb
1—24" x 24" x 6' Flather
3—24" x 24" x 6' American
1—24" x 24" x 6' Pond
1—24" x 24" x 6' Gray
1—24" x 24" x 8' Flather
1 26" x 26" x 5' Gray
1—26" x 26" x 6' Hendey
2—26" x 26" x 7' Gray
1 27" x 27" x 6' Ohio
1 28" x 28" x 7' Flather
1 28" x 28" x 6' Gray
1—30" x 30" x 6' Pease
1—30" x 30" x 6' Gray
1—36" x 35" x 10' Pond
1—72" x 56" x 16' Gray

RADIAL DRILLS

1 2' American
1—2' Fosdick
3—2½' Fosdick
2—2½' Gang
1 2½' American
1—2½' Mueller
2—3' Dreses
2—3' Fosdick
3—3' Prentice
1—3½' Gang
1 3½' Hamilton
1—3½' Bickford
1 4' Dreses
2 5' Prentice
1 5' Baush
2 5' Western
1—6' Bickford
1—6½' Baush

Our GREEN LIST Just Published Gives Descriptions.
Write Or Wire Us For Your Copy.

HILL, CLARKE & CO. OF CHICAGO

125 N. CANAL ST., CHICAGO

The advertiser would like to know where you saw his advertisement—tell him.

MORTON MANUFACTURING CO.
PORTABLE PLANERS
DRAW CUT SHAPERS
SPECIAL DRAW CUT R R SHAPERS
FINISHED MACHINE KEYS
STATIONARY & PORTABLE KEY WAY CUTTERS
SPECIAL LOCOMOTIVE CYLINDER PLANERS
OFFICE AND WORKS: MUSKEGON HEIGHTS U.S.A.

DENNISTEEL
LONDON - CANADA
THE BEST STEEL LOCKERS MADE IN CANADA
MADE BY
THE DENNIS WIRE AND IRON WORKS CO. LIMITED
LONDON, CANADA

"HAWK" D CHROME VANADIUM STEEL

Will Give You Exceptional

Shell Forging Production

WITHOUT AN EQUAL FOR BOTH FIRST AND SECOND OPERATION PUNCHES.

Comes to you heat-treated and ready for use.

It does not stick to the work.

There are many cases where each punch has turned out over 2,000 shells.

It means more shells, per machine per day.

STEEL OF EVERY DESCRIPTION.

Hawkridge Brothers Company

303 Congress St., BOSTON, MASS.

Tungsten High-Speed Steel

We have good quantities in our New York Stock, and can also make Tonnage Delivery from January forward of our Rushitoff No. 6 and No. 7.

Orders must be to hand before Dec. 25.

We also have complete stocks of Nickel, Chrome Nickel, Chrome Vanadium, and Tool Steels.

Fairley Davidson Steel Co.

MAIN OFFICE AND WAREHOUSE:
124 Maiden Lane - NEW YORK
Cable Address: "Artdavison."

FIRE BRICK

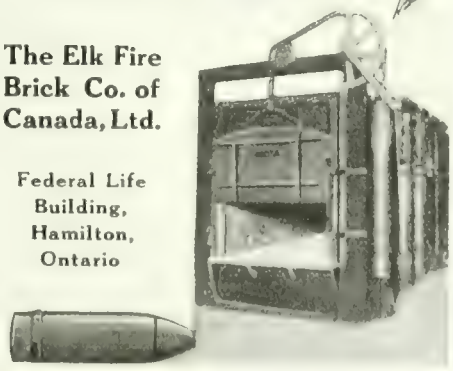
For Heat-Treating Furnaces, etc.

USING ELK FIRE BRICK IN LINING HEAT - TREATING FURNACES IS ANOTHER WAY OF ADDING TO THEIR EFFICIENCY, ECONOMY AND DURABILITY.

We carry in stock a large variety of shapes and sizes

Write for catalog.

We can fill all orders promptly.



The Elk Fire Brick Co. of Canada, Ltd.

Federal Life Building, Hamilton, Ontario

METAL STAMPINGS

We are manufacturers of stamped parts for other manufacturers.

We do any kind of sheet metal stamping that you require. Our improved presses and plating plant enable us to produce the finest quality of work in a surprisingly short time.

We can finish steel stamping in Nickel, Brass or Copper.

Send us a sample order.

W. H. BANFIELD & SONS

372 Pape Avenue Toronto

MACHINE TOOLS

The list below is a small portion of our present stock. Write for complete lists.

14" x 5' New York Safety
14" x 8' Hendey Quick Change
14" x 6' Flather (3)
14" x 6' Ashton
15" x 6' Blaisdell
15" x 8' Goddard
15" x 12' Sebastian
16" x 6' Davis Quick Change
16" x 6' Porter
16" x 6' F. E. Reed
16" x 6' Flather
16" x 6' Blaisdell
16" x 6' Harrington
16" x 6' Place Engine Lathe
16" x 7' Wheeler
16" x 8' Pratt & Whitney (2)
18" x 14' Fitchburg (2)
18" x 7' Lodge & Davis Turret on bed
18" x 6' Hamilton
20" x 12' Fitchburg
20" x 8' 6" New Haven
21" x 12' Fairbanks
24" x 12' LeBlond, Quick Change, Taper Attachment
26" x 18' Niles
60" x 12' Putnam
40" Conrads n Turr t Lathe, $3^3/_4$", hollow spindle
2-13" Gisholt Turret, complete with chucking outfit, practically new, used less than two months.
16" x 6' Johnson B. G. Turret
16" x 6' Windsor, B. G. Turret
16" x 6' Warner Swasey, Plain Head Turret
15" x 5' Lodge & Davis, Plain Head Turret
12" x 4' Lodge & Shipley, Plain Head Turret
12" x 4' Jones & Lamson, B. G. Turret
4—$2^1/_4$" Cleveland Semi-Automatic Screw Machines
2—$^1/_2$" P. & W. Hartford Automatic Screw Machines
2—3-16' Potter & Johnson H. S. Lathes

FRANK TOOMEY, INC.
131 North Third Street - PHILADELPHIA, PA.

Don't Keep It--Sell It!

If you have a lathe
a drill
a milling machine
a planer
a chain block
a chuck
a motor
a crane
a stock of belting
an engine
a compressor
or any other machine shop equipment for which you really have no further use, why not turn it into *cash?*

Someone may be looking for just the machine you may want to sell. Let us bring you together.

A "classified" ad. in CANADIAN MACHINERY, costing a few cents per issue, has done wonders for others. Why not try it?

Why go to the expense of buying new machines for the manufacture of

SHELLS?

We have already shipped some 75 carloads of

Rebuilt Machine Tools

to CANADA since the outbreak of the war, with absolute satisfaction in each case.

If you need any equipment it will be to your advantage to get in touch with us as our facilities for furnishing rebuilt machinery are second to none on the continent.

EVERY MACHINE WE BUY IS PUT THROUGH OUR OWN SHOPS AND COMES OUT IN ABSOLUTELY PERFECT ORDER—AND WE STAND BEHIND EVERY ONE WE SELL.

The demand is enormous, but we are not taking advantage of the war by putting on exorbitant prices—our aim is a good, square deal to everybody all the time. You can often get something practically equal to a new machine at a very great saving in price.

As we carry a large stock, we can likely supply you from stock, or if we cannot do this, we will take your order for future delivery, specifying a definite time when we will supply you with such tools as you may require.

New York Machinery Exchange
50 Church St., New York

HINTS TO BUYERS

The HURLBUT-ROGERS CUTTING-OFF MACHINE

Cuts Off In Half The Time

The Hurlbut-Rogers Cutting-Off and Centering Machine is a big producer because there are TWO TOOLS instead of one, working in the same cut.
VERY POWERFUL, RIGID AND ACCURATE.
Pays its cost in savings effected in very few months.
ASK FOR FULL DETAILS.

The Hurlbut Rogers Machinery Co.
So. Sudbury, Mass.

FOREIGN AGENTS: England, Chas. Churchill & Co., Ltd., London, Manchester, Glasgow and Newcastle-on-Tyne.
H. W. PETRIE, TORONTO, CANADA.

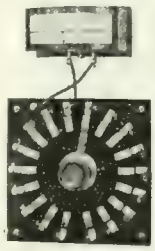
Genuine Armstrong Stocks and Dies

Hinged Pipe Vises.
Pipe Cutters. Steam and Gas Fitters' Tools.
Pipe Machines for Threading Pipe.
Either Hand or Power.

Manufactured by

THE ARMSTRONG M'F'G CO.
328 KNOWLTON ST. BRIDGEPORT, CONN.
NEW YORK, 248 CANAL ST.

If YOU are Making SHRAPNEL



You need a

TWINKO

Indicating or Recording PYROMETER

It will insure the metal being treated at the right temperature. Don't take any risks.

Write for Bulletins Nos. 6 and 7.

THWING INSTRUMENT COMPANY
441 N. 5th St., Philadelphia, Pa.
Canadian Representative:
JAS. DE VON, 227 Davenport Road, Toronto, Ont.

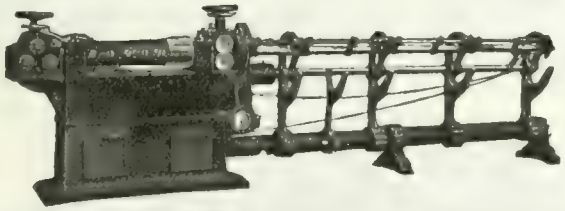
The Garvin Machine Co.

Manufacturers of

Milling Machines; Profiling Machines; Cam Cutting Machines; Screw Machines; Monitor Lathes; Die Slotting Machines; Screw Slotters; Tapping Machines; Duplex Horizontal Drills; Gang Drill Presses; Four-Head Right-Angle Drills; Wrenchless Chucks; Spring Coilers; Cutter Grinding Machines; Surface Grinders; Hole Grinders; Hand Lathes and Special Machinery.

We Want All To Have Our Catalog—Send For It To-day.

Spring and Varick Streets NEW YORK CITY



THE WIRE IS PERFECTLY STRAIGHT

and cut to accurate lengths when it comes from our AUTOMATIC WIRE STRAIGHTENING AND CUTTING MACHINE, whether it's ¾" diameter or only .020" wire, hard or soft wire, highly polished or rough stock.

May we send you catalogue C?

The F. B. SHUSTER COMPANY, New Haven, Conn.
Formerly John Adt & Son. Established 1860
Also makers of Riveting Machines, Sprue Cutters, Cotter Pin Machines, etc.

SHAFTING

Cold Drawn, Turned and Polished Steel, Rounds, Squares, Hexagons and Flats, Steel Piston Rods, Pump Rods.

Special facilities for Keyseating up to 6 in. diameter.

THE
Canadian Drawn Steel Co.
Limited
HAMILTON CANADA

If what you want is not advertised in this issue consult the Buyers' Directory at the back.

GEARS

CUT GEARS

HAMILTON

GEAR & MACHINE CO.

Cor. Concord & Van Horne **TORONTO**

ACCURACY IN CUTTING makes SILENT POWER

A BALATA BELTING

Which We Guarantee Second To None And Entirely Satisfactory

Try One And Be Convinced

J.C.McLAREN BELTING CO. Limited

MONTREAL TORONTO WINNIPEG

TRADE MARK

THE J.C.McLAREN BELTING Co LIMITED

You want Tool Holders that have made good

ARMSTRONG TOOL HOLDERS

Won The

GRAND PRIZE

THE HIGHEST POSSIBLE AWARD AT THE PANAMA-PACIFIC INTERNATIONAL EXPOSITION.

THEY ALWAYS MAKE GOOD

Write for Catalog.

Armstrong Bros. Tool Co.

"The Tool Holder People"

306 N. Francisco Ave., CHICAGO, U.S.A.

We will investigate and solve your engineering problems from a standpoint of commercial success.

No doubt you have some problems right now, that would pay you to have us look into.

CANADIAN INSPECTION AND TESTING LABORATORIES, LIMITED

Head Office and Main Laboratories—MONTREAL

Branch Offices and Laboratories:
TORONTO, WINNIPEG, EDMONTON, VANCOUVER, NEW GLASGOW.

HIGH-GRADE

Iron Working Machinery

Specially adapted for manufacturing

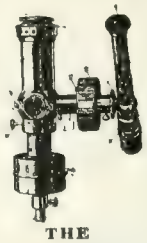
WAR AMMUNITION

DROP A CARD TO

Canada Machinery Agency

298 St. James Street, Montreal

For Hardness Testing



in shop and laboratory use the

Standard Scleroscope

Universally adopted; direct reading; inexpensive, and the only instrument that agrees with others of its kind in all parts of the World thus solving problems of ordering materials to specification.

BOOKLET FREE.

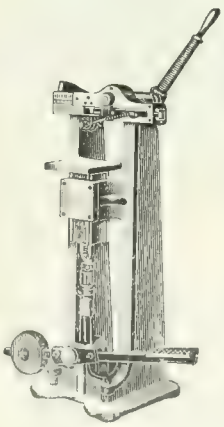
Heat Indication

THE PYROSCOPE by optical means is fast becoming the correct thing. The PYROSCOPE has solved the problem. THE SCLEROSCOPE (Set)

Perfect constancy, inexpensive, no electricity used. Built to stand rough usage and upon common-sense lines. Used by the Government and best firms.

Shore Instrument & Mfg. Co. 555-7 W. 22nd St. New York

Agents for Canada: A R. Williams Machy. Co., Ltd., Toronto, Can.



DWIGHT SLATE MARKING MACHINE

TRADE MARK

For Marking Shrapnel Shells

or they will mark any article, either round or flat. Power or Hand Machines recommended.

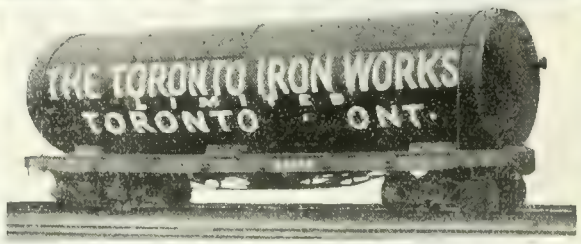
Steel Stamp and Die Cutting by expert engravers.

Send for Catalogue.

Noble & Westbrook Mfg. Co.

Hartford, Conn., U. S. A.

RIVETED STEEL TANKS FOR EVERY PURPOSE



OIL STORAGE - GASOLINE TANKS - AIR RECEIVERS
PNEUMATIC WATER SUPPLY TANKS - SMOKE STACKS
BOILER BREECHING - RIVETED STEEL PIPE, BINS & HOPPERS

The advertiser would like to know where you saw his advertisement— tell him.

MALLEABLE
GREY IRON
ALUMINUM
& BRASS
CASTINGS

The selection of metals and the necessary treatments are governed by the purpose for which each casting is required

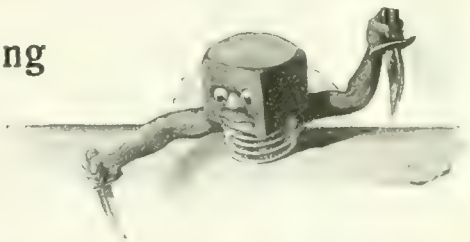
The quality is always of the highest standard.

Our castings "stand up" to service where others fall down.

Try them and you'll be convinced.

The Galt Malleable Iron Co., Limited
GALT, ONTARIO

Projecting
Screw
Heads



Are Whirling Dervishes of Death

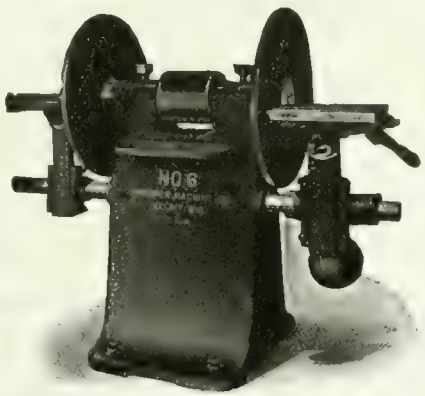
Invisible till they get you. They are fatal to the extent of over 1,500 persons killed or maimed each year in the United States. No heads are needed with "Allen" Safety Set Screws.

Write for Circular No. 3.

THE ALLEN MFG. CO., Inc., Hartford, Conn., U.S.A.
England: 173 Princess Street, Manchester

Gardner Disc Grinder

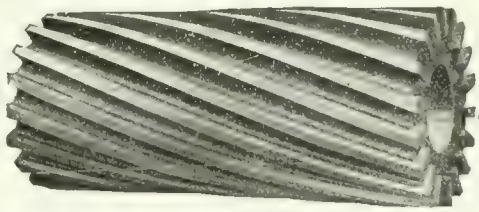
Gardner Disc Grinders are made in all sizes, types and combinations. We can successfully meet any disc grinding problem in existence. Largest builders of Disc Grinding machinery in the world.



Gardner
Machine Co.
The Disc Grinding Authorities
BELOIT, WIS.
Canadian Agents: A. R. Williams Machinery Co.

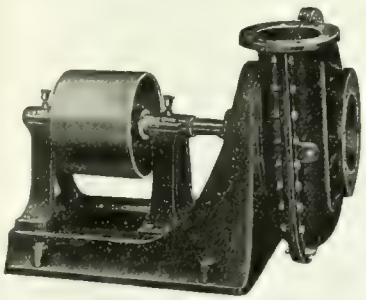
Taylor-Newbold Milling Cutters

Fast Cutting
Powerful



Inserted Helical Blades of High-Speed Steel

For Service—Utility—Strength—Power
4 in. DIAMETER FOR GENERAL USE
Send for Bulletin R. P.
THE TABOR MANUFACTURING COMPANY
PHILADELPHIA, PA., U.S.A.



The Best Insurance against expensive break-down delays is

A RELIABLE PUMP

AS BUILT BY

THE SMART-TURNER MACHINE CO. LIMITED
HAMILTON - CANADA

The Scott Manufacturing Co.
125 Lansdowne Ave., TORONTO

METAL SPECIALTIES

TOOL AND DIE MAKING

20 TIMES THE SERVICE

That's what this self-hardening, high speed steel chaser does for the LANDIS DIE.

Form lag cutters tangentially disposed to the work carried in suitable holders make an ideal cutting condition. This, along with its many other distinctive characteristics, has established for us a world-wide reputation.

WRITE FOR CATALOGUE NO. 21.

Landis Machine Co., Waynesboro, Pa.
Exclusive Canadian Representatives,
Williams & Wilson, Montreal, Canada.

PRESSES—ALL TYPES

Press Attachments, Automatic.
Metal and Wire Forming Machines.
Tumblers—Large Line.
Burnishing Machines, Grinders.
Special Machines.

Baird Machine Co., Bridgeport, Conn.

Detective and Stop Watch Combined

"We have a counter on every one of our presses, even the foot presses." This from a satisfied user of our counters. If you use presses our counters would save you money.

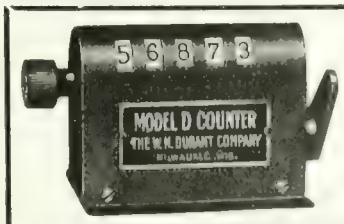
Ask for Catalog 25.

The C. J. ROOT CO., 125 Bridge Street, Bristol, Conn.

GEARS AND GEAR CUTT
SPROCKETS AND CHAINS

In stock and to order any size from one-quarter inch to six-foot in diameter, any material. Estimates and gear advice cheerfully furnished.

Grant Gear Works, Inc., 151 Pearl St Boston, Mass
G. B. GRANT



DECREASE YOUR LOSSES

In knowing what your Presses are producing. Deeper Counters have the brightest figures, greatest visibility, widest variety of styles and sizes and are Less Per Year.

Catalog 29

THEY PAY THEIR WAY

Durant Manufacturing Company
Milwaukee, Wisconsin

If what you want is not advertised in this issue consult the Buyers' Directory at the back.

NORTON JACKS

For all kinds of heavy lifting

Send for complete catalogue showing 50 styles
10 to 100 tons capacity.

Made only by

A. O. NORTON, LIMITED

Coaticook, Prov. Quebec - - Canada

PULLEYS

ALL WOOD—COMBINATION—IRON—STEEL

Every pulley fully guaranteed.
Write for interesting printed matter.

The Positive Clutch & Pulley Works, Ltd.

Montreal Factory: Aurora, Ont. Toronto

HAWKESBURY

— ONTARIO —

AN IDEAL LOCATION FOR FOUNDRY AND MACHINE SHOP

Abundant electric power is available at reasonable rates. Shipping is easy by the G.T.R. and Canadian Northern main line and Ottawa River. Much old castings and scrap iron is available. Also good opening for other industries.

INVESTIGATE. For particulars apply to BRUNO BOUVRETTE, Secretary, Hawkesbury Board of Trade.

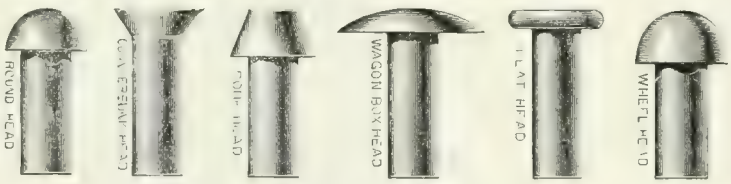
AUTOMATIC

WOOD SCREW MACHINES

Cable Address:
Cook, Hartford, U.S.A.

Asa S. Cook Co.

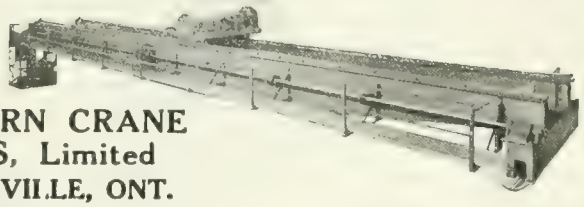
Hartford, Conn.



WE MANUFACTURE RIVETS of every description, ½ inch. dia. and smaller.

PARMENTER & BULLOCH CO., LTD.

GANANOQUE, ONT.

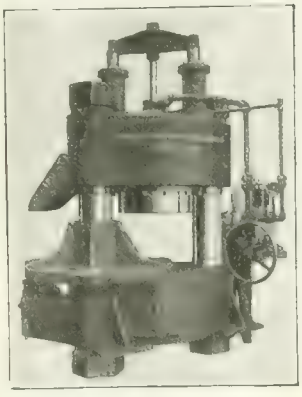


NORTHERN CRANES

ELECTRIC AND HAND POWER
ALL SIZES, CAPACITIES AND TYPES
ALSO ELECTRIC AND AIR HOISTS
Foundry Equipment—Cupolas, Ladles, Etc.

NORTHERN CRANE WORKS, Limited
WALKERVILLE, ONT.

BUY IN CANADA!



ELMES HYDRAULIC PRESSES

Rapid-acting hydraulic drawing presses, piercing presses, pumps, and accumulators for making Shells, etc. High pressure fittings and valves, quick shipment.

Send for our illustrated catalog to-day

Charles F. Elmes Engineering Works

217 N. Morgan Street, Chicago, U.S.A.

Over 50 years' experience building hydraulic machinery.

The advertiser would like to know where you saw his advertisement—tell him.

CANADIAN MACHINERY BUYERS' DIRECTORY

TO OUR READERS—Use this directory when seeking to buy any machinery or power equipment. You will often get information that will save you money.

TO OUR ADVERTISERS—Send in your name for insertion under the headings of the lines you make or sell

TO NON-ADVERTISERS—A rate of $5 per line a year is charged non-advertisers.

Abrasive Materials.
Can. Fairbanks-Morse Co., Montreal.
Carborundum Co., Niagara Falls, N.Y.
Ford-Smith Machine Co., Hamilton, Ont.
Gardner Machine Co., Beloit, Wis.
Norton Co., Worcester, Mass.
H. W. Petrie, Toronto.
Stevens, F. B., Detroit, Mich.

Acetylene.
L'Air Liquide Society, Montreal, Toronto.
Lever Bros., Toronto.

Acetylene Generators.
L'Air Liquide Society, Montreal, Toronto.
Lever Bros., Toronto.

Accumulators, Hydraulic.
Can. Boomer & Boschert Press Co., Montreal.
Charles F. Elmes Eng. Wks., Chicago.
Mesta Machine Co., Pittsburg, Pa.
William R. Perrin, Ltd., Toronto.
Southwark Foundry & Machine Co., Philadelphia.
Wm. Tod Company, Youngstown, O.
Watson-Stillman Co., Aldene, N.J.
Wood, R. D., & Co., Philadelphia.

Air Compressors.
Canadian Ingersoll-Rand Co., Ltd., Montreal.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Curtis Pneumatic Machinery Co., St. Louis, Mo.
H. W. Petrie, Toronto.
Smart-Turner Machine Co., Hamilton.

Air Hoists.
Northern Crane Works, Ltd., Walkerville, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

Air Hose.
Can. H. W. Johns-Manville Co., Limited, Toronto.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Can. Ingersoll-Rand Co., Montreal.

Air Receivers.
Can. Ingersoll-Rand Co., Montreal.
MacKinnon, Holmes Co., Sherbrooke.

Air Washers.
Buffalo Forge Co., Buffalo, N.Y.
Can. Sirocco Co., Ltd., Windsor, Ont.

Anmeters.
Can. H. W. Johns-Manville Co., Limited, Toronto.

Aluminum.
Tallman Brass & Metal Co., Hamilton.

Alloys, Steel.
H. A. Drury Co., Ltd., Montreal.
Hawkridge Bros. Co., Boston, Mass.
Vanadium Alloys Steel Co., Pittsburg, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

Annunciator Systems.
Lintz Porter Co., Toronto.

Arbors.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill and Machine Co., New Bedford.
H. W. Petrie, Toronto.
Plessisville Foundry, Plessisville, Que.
Pratt & Whitney Co., Dundas, Ont.

Assembling Stands.
Skinner Chuck Co., New Britain, Conn.

Automatic Chucks.
Garvin Machine Co., New York.

Asbestos Packing.
Can. H. W. Johns-Manville Co., Limited, Toronto.

Autogenous Welding and Cutting Plants.
L'Air Liquide Society, Montreal, Toronto.
Lever Bros., Toronto.

Automatic Index Milling Machines.
Garvin Machine Co., New York.
National Machinery and Supply Co., Hamilton.
H. W. Petrie, Toronto.

Automatic Machinery.
Baird Machine Co., Bridgeport, Conn.
A. R. Williams Machy. Co., Toronto.
Gardner, Robt., & Son, Montreal.
Girard Machine & Tool Co., Philadelphia, Pa.
Motch & Merryweather Machy. Co., Cleveland, O.
National Machinery & Supply Co., Hamilton.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.
Owen Sound Iron Works Co., Owen Sound.
Windsor Machine Co., Windsor, Vt.

Automatic Multiple Spindle.
Windsor Machine Co., Windsor, Vt.

Automatic Wood Screw Machines.
Asa F. Cook Co.

Axle Cutters.
Butterfield & Co., Rock Island, Que.
A. R. Jardine & Co., Hespeler, Ont.

Automobile Fenders.
Dominion Forge & Stamping Co., Walkerville, Ont.

Automobile Hoods.
Dominion Forge & Stamping Co., Walkerville, Ont.

Babbitt Metal.
Can. Fairbanks-Morse Co., Montreal.
Hoyt Metal Co., Toronto.
Magnolia Metal Co., Montreal.
H. W. Petrie, Toronto.
Tallman Brass & Metal Co., Hamilton.

Baking Ovens.
Oven Equipment & Mfg. Co., New Haven, Conn.
Owen Sound Iron Works Co., Owen Sound.

Ball Bearings.
Can. Fairbanks-Morse Co., Montreal.
Chapman Double Ball Bearing Company, Toronto.
H. W. Petrie, Toronto.

Barnishing Machines.
Baird Machine Co., Bridgeport, Conn.

Banding Machines, Hydraulic.
West Tire Setter Co., Rochester, N.Y.

Barrels, Steel Shop.
Baird Machine Co., Bridgeport, Conn.
Cleveland Wire Spring Co., Cleveland.

Bar Steel.
Steel Co. of Canada, Hamilton, Ont.

Bars, Boring.
Charles F. Elmes Eng. Works, Chicago
Niles-Bement-Pond Co., New York.
Owen Sound Iron Works Co., Owen Sound.

Bar Benders and Straight Edges.
Steel Bending Brake Works, Ltd., Chatham, Ont.

Bar Benders, Hydraulic.
Charles F. Elmes Eng. Works, Chicago
Watson-Stillman Co., Aldene, N.J.

Bar Twisting Machines.
Mesta Machine Co., Pittsburg, Pa.

Batteries and Accessories.
Lintz Porter Co., Toronto.

Bell Systems.
Lintz-Porter Co., Toronto.

Belt Benches.
Tabor Mfg. Co., Philadelphia, Pa.

Belting, Balata.
E. Reddaway & Co., Montreal.

Belting, Camel Hair.
E. Reddaway & Co., Montreal.

Belt Dressing and Cement.
Graton & Knight Mfg. Co., Montreal.
Belt Fasteners.
E. Reddaway & Co., Montreal.

Belt Lacing Leather.
Graton & Knight Mfg. Co., Montreal.

Belting, Chain.
Can. Fairbanks-Morse Co., Montreal.
Graton & Knight Mfg. Co., Montreal.
Jones & Glassco, Montreal.
Morse Chain Co., Ithaca, N.Y.
H. W. Petrie, Toronto.

Belting, Cotton.
General Supply Co. of Canada, Ltd., Ottawa.
Dominion Belting Co., Hamilton.
H. W. Petrie, Toronto.
E. Reddaway & Co., Montreal.

Belting, Leather.
Can. Fairbanks-Morse Co., Montreal.
General Supply Co. of Canada, Ltd., Ottawa.
Girard Machine & Tool Co., Philadelphia, Pa.
Graton & Knight Mfg. Co., Montreal.
Main Belting Co., Montreal.
Morse Chain Co., Ithaca, N.Y.
H. W. Petrie, Toronto.

Belting, Stitched Cotton Duck.
General Supply Co. of Canada, Ltd., Ottawa.
Dominion Belting Co., Hamilton, Ont.
Main Belting Co., Montreal.
H. W. Petrie, Toronto.
E. Reddaway & Co., Montreal.

Belting, Rubber.
Can. H. W. Johns-Manville Co., Limited, Toronto.

Benders, Angle and Tee Iron.
Can. Buffalo Forge Co., Montreal.
Watson-Stillman Co., Aldene, N.J.

Bending Machinery.
John Bertram & Sons Co., Dundas.
Bertrams, Limited, Edinburgh, Scotland.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Can. Buffalo Forge Co., Montreal.
Can. Machinery Corporation, Galt, Ont.
Charles F. Elmes Eng. Works, Chicago
Jardine, A. B., & Co., Hespeler, Ont.
National Machinery Co., Tiffin, Ohio.
National Machinery & Supply Co., Hamilton.
Niles-Bement-Pond Co., New York.
Owen Sound Iron Works Co., Owen Sound.
H. W. Petrie, Toronto.
Toledo Machine & Tool Co., Toledo, O.
Steel Bending Brake Works, Chatham, Ont.
Watson-Stillman Co., Aldene, N.J.

Bins, Steel.
Dennis Wire & Iron Works Co., Ltd., London, Canada.
MacKinnon, Holmes Co., Sherbrooke.
Toronto Iron Works, Ltd., Toronto.

Bit Brace Tools.
Wells Bros. Co., Greenfield, Mass.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Blast Gauges, Cupola.
Can. Buffalo Forge Co., Montreal.
Sheldons, Ltd., Galt, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

Blocks, Lifting.
Northern Crane Works, Walkerville.

Blowers.
Can. Buffalo Forge Co., Montreal.
Can. Sirocco Co., Ltd., Windsor, Ont.
Chicago Flexible Shaft Co., Chicago.
Girard Machine & Tool Co., Philadelphia, Pa.
Sheldons, Ltd., Galt, Ont.
Southwark Foundry & Machine Co., Philadelphia.

Blow Pipes and Regulators.
L'Air Liquide Society, Montreal, Toronto.
Lever Bros., Toronto.

Bluing Ovens.
Oven Equipment & Mfg. Co., New Haven, Conn.

Boartz.
Geo. A. Jones Co., Ltd., New York N.Y.

Boilers.
Can. Locomotive Co., Kingston, Ont.
General Supply Co. of Canada, Ltd., Ottawa.
MacKinnon, Holmes Co., Sherbrooke, Que.
National Machinery & Supply Co., Hamilton.
Owen Sound Iron Works Co., Owen Sound.
H. W. Petrie, Toronto.
Plessisville Foundry, Plessisville, Que.

Boiler Compounds.
Can. H. W. Johns-Manville Co., Limited, Toronto.

Boiler Graphite.
Dixon Crucible Co., Jersey City, N.J.

Boiler Makers' Supplies.
Jno. F. Allen Co., New York.

Bolt Cutters and Nut Tapers.
Wells Brothers Co., Greenfield, Mass.

Bolts.
Galt Machine Screw Co., Galt, Ont.
London Bolt & Hinge Works, London, Ont.
Steel Co. of Canada, Hamilton, Ont.

Bolt and Nut Machinery.
A. R. Williams Machy. Co., Toronto.
John Bertram & Sons Co., Dundas.
Owen Sound Iron Works Co., Owen Sound.
Gardner, Robt., & Son, Montreal.
Landis Machine Co., Waynesboro, Pa.
National Machinery Co., Tiffin, O.
National Machinery & Supply Co., Hamilton.
H. W. Petrie, Toronto.
Wiley & Russell Co., Greenfield, Mass.

Boring Machines, Upright and Horizontal.
John Bertram & Sons Co., Dundas.
Colburn Machine Tool Co., Franklin, Pa.
Garlock-Machinery, Toronto.
Girard Machine & Tool Co., Philadelphia, Pa.
Hill, Clarke & Co., of Chicago, Chicago, Ill.
Motch & Merryweather Machy. Co., Cleveland, O.
National Machinery & Supply Co., Hamilton.
Niles-Bement-Pond Co., New York.
Oliver Machy. Co., Grand Rapids
Stow Mfg. Co., Binghamton, N.Y.

Boring Machines, Pneumatic, Cylinder.
Baker Brothers, Toledo, O.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.
H. W. Petrie, Toronto.
Stow Mfg. Co., Binghamton, N.Y.

Boring and Turning Mills.
John Bertram & Sons Co., Dundas.
Girard Machine & Tool Co., Philadelphia, Pa.
National Machinery & Supply Co., Hamilton.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.

Boxes, Annealing, Charging.
Mesta Machine Co., Pittsburg, Pa.

Box Puller.
Jardine, A. B., & Co., Hespeler, Ont.

Boxes, Steel Shop.
Cleveland Wire Spring Co., Cleveland.

Boxes, Tote.
Cleveland Wire Spring Co., Cleveland.

Brakes.
Brown, Boggs & Co., Hamilton, Can.
Whiting Foundry Equipment Co., Harvey, Ill.

Brakes, Heavy Plate Bending and Cornice.
Steel Bending Brake Works, Ltd., Chatham, Ont.

Brass Working Machinery.
A. R. Williams Machy. Co., Toronto.
Gardner, Robt., & Son, Montreal.
Girard Machine & Tool Co., Philadelphia, Pa.
National Machinery & Supply Co., Hamilton.
Warner & Swasey Co., Cleveland.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.

Brick Cars.
Can. Buffalo Forge Co., Montreal.
Sheldons, Ltd., Galt, Ont.

Brick Dryers.
Can. Buffalo Forge Co., Montreal.
Can. Sirocco Co., Ltd., Windsor, Ont.
Sheldons, Ltd., Galt, Ont.

Brick Machinery.
Eastern Machinery Co., New Haven.
Sheldons, Ltd., Galt, Ont.

Bridges, Railway and Highway.
Can. Bridge Co., Walkerville, Ont.
MacKinnon, Holmes Co., Sherbrooke Que.

Bubblers.
Puro Sanitary Drinking Fountain Co., Haverhill, Mass.

Buckets, Clam Shell, Crab and Dump.
Northern Crane Works, Ltd., Walkerville, Ont.
Whiting Foundry Equipment Co. Harvey, Ill.

Buffing and Polishing Machinery.
Canadian Hart Wheels, Ltd., Hamilton, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Girard Machine & Tool Co., Philadelphia, Pa.
New Britain Machine Co. New Britain, Conn.

Bulldozers.
John Bertram & Sons Co., Dundas.
E. W. Bliss Co., Brooklyn, N.Y.
Canada Mach. Corporation Galt, Ont.
National Machinery & Supply Co., Hamilton, Ont.
Watson-Stillman Co., Aldene, N.J.

Burners, Enclosed Flame Gas.
Oven Equipment & Mfg. Co., New Haven, Conn.

Burners, Fuel, Oil and Natural Gas.
Northern Crane Works, Ltd., Walkerville, Ont.
Whiting Foundry Equipment Co. Harvey, Ill.

Burring Reamers.
Wells Brothers Company, Greenfield Mass.
Wilt Twist Drill Co. of Canada, Ltd. Walkerv Ont.

Butterine.
Wells Brothers Company, Greenfield Mass.

Burrs, Iron and Copper.
Parmenter & Bulloch Co., Gananoque

Canners' Machinery.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Can.
National Machinery & Supply Co., Hamilton, Ont.

Caissons.
Toronto Iron Works Ltd., Toronto.

Cars, Charging Box Ingot.
Mesta Machine Co., Pittsburg, Pa.

Cars, Industrial.
Can. Buffalo Forge Co., Montreal.
Can. Fairbanks-Morse Co., Montreal.
Sheldons, Limited, Galt, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

Castings, Aluminum.
Cunningham & Son, St. Catharines, Ont.
Owen Sound Iron Works Co., Ltd., Owen Sound, Ont.
St. Lawrence Foundry, Galt, Ont.
Tallman Brass & Metal Co., Hamilton

Castings, Air Furnaces.
Wm. Tod Company, Youngstown, O.

Castings, Brass.
Cunningham & Son, St. Catharines, Ont.
Alexander Fleck, Ltd., Ottawa.
T. C. Lawrence Foundry, Galt, Ont.
Mesta Machine Co., Pittsburg, Pa.
Owen Sound Iron Works Co., Owen Sound.
Plessisville Foundry, Plessisville, Que.
Tallman Brass & Metal Co., Hamilton
Wm. Tod Company, Youngstown, O.

Castings, Bronze.
Cunningham & Son, St. Catharines, Ont.
Mesta Machine Co., Pittsburg, Pa.
Tallman Brass & Metal Co., Hamilton
Wm. Tod Company, Youngstown, O.

Castings, Copper.
Cunningham & Son, St. Catharines, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

Castings, Gray Iron.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Erie Foundry Co., Erie, Pa.
Alexander Fleck, Ltd., Ottawa.
Gardner, Robt., & Son, Montreal.
Hull Iron & Steel Foundries, Ltd., Hull Quebec.
Wm. Kennedy & Sons, Ltd., Owen Sound.
Mesta Machine Co., Pittsburg, Pa.
Owen Sound Iron Works Co., Owen Sound.
Plessisville Foundry, Plessisville, Que.
Wm Tod Company, Youngstown, O.

Castings, Steel Chrome and Manganese Steel.
Hull Iron & Steel Foundries, Ltd., Hull Quebec.
Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.
Mesta Machine Co., Pittsburg, Pa.
Wm Tod Company, Youngstown, O.

Castings, Malleable.
Galt Malleable Iron Co., Galt.

Castings, Nickel Steel.
Hull Iron & Steel Foundries, Ltd., Hull, Quebec.
Mesta Machine Co., Pittsburg, Pa.

Cement, Disc Wheel.
Gardner Machine Co., Beloit, Wis.

Cement, Iron.
Can. H. W. Johns-Manville Co., Limited, Toronto.
Shelton Metallic Filler Co., Derby, O.

Cement Machinery.
Can. Fairbanks-Morse Co., Montreal.
Gardner, Robt., & Son, Montreal.
National Machinery & Supply Co., Hamilton, Ont.
Owen Sound Iron Works Co., Owen Sound.
H. W. Petrie, Toronto.

Centre Reamers.
Wells Brothers Co., Greenfield, Mass.

Centering Machines.
John Bertram & Sons Co., Dundas.
Gardner, Robt., & Son, Montreal.
Girard Machine & Tool Co., Philadelphia, Pa.
Hurlbut, Rogers Machinery Co., South Sudbury, Mass.
National Machinery & Supply Co., Hamilton.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.

Centrifugal Pumps.
Can. Buffalo Forge Co., Montreal.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.
Southwark Foundry & Machine Co., Philadelphia, Pa.
Smart-Turner Machine Co., Hamilton, Ont.

Chain Blocks.
Can. Fairbanks-Morse Co., Montreal.
National Machinery & Supply Co., Hamilton.
H. W. Petrie, Toronto.

Chains, Silent and Transmission.
Jones & Glassco, Montreal.
Morse Chain Co., Ithaca, N.Y.
Plessisville Foundry, Plessisville, Que.

Chemists.
Can Inspection & Testing Laboratories, Ltd., Montreal.
Toronto Testing Laboratory, Ltd., Toronto.

Chucks, Aero, Automatic.
Garvin Machine Co., New York.

Chucks, Drill, Lathe and Universal.
John Bertram & Sons Co., Dundas, Ont.
Buffalo Forge Co., Buffalo, N.Y.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Cushman Chuck Co., Hartford, Conn.
Gardner, Robt., & Son, Montreal.
Girard Machine & Tool Co., Philadelphia, Pa.
Wells Brothers Co., Greenfield, Mass.
Jacobs Mfg. Co., Hartford, Conn.
Ker & Goodwin, Brantford.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Bedford.
National Machinery & Supply Co., Hamilton.
H. W. Petrie, Toronto.
Skinner Chuck Co., New Britain, Conn.
D. E. Whiton Machine Co., New London, Conn.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Chucks, Drill, Automatic and Keyless.
Buffalo Forge Co., Buffalo, N.Y.

Chucks, Ring Wheel.
Gardner Machine Co., Beloit, Wis.

Chucking Machines.
Garvin Machine Co., New York.
Girard Machine & Tool Co., Philadelphia, Pa.
New Britain Machine Co., New Britain, Conn.
Niles-Bement Pond Co., New York.
Turner Machine Co., Danbury, Conn.
Warner & Swasey Co., Cleveland, O.

Circular Safety Cylinders.
Oliver Machy. Co., Grand Rapids, Mich.

Clocks, Time and Watchman's.
Lintz-Porter Co., Toronto.

Cloth and Wool Dryers.
Canada Wire & Iron Goods Co., Hamilton, Ont.
Sheldons, Limited, Galt.

Clutches.
Eastern Machinery Co., New Haven, Conn.
Jones & Glassco, Montreal.
Owen Sound Iron Works Co., Owen Sound.
Positive Clutch & Pulley Works, Ltd., Toronto.

Coal Handling Machinery.
Northern Crane Works, Ltd., Walkerville, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

Coke and Coal.
Hanna & Co., M. A., Cleveland, O.

Collectors, Pneumatic.
Can. Buffalo Forge Co., Montreal.
Sheldons, Limited, Galt.

Compressors, Air.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Independent Pneumatic Tool Co., Chicago.
Mesta Machine Co., Pittsburg, Pa.
National Machinery & Supply Co., Hamilton.
H. W. Petrie, Toronto.
Southwark Foundry & Machine Co., Philadelphia, Pa.
The Smart-Turner Machine Co., Hamilton.

Concentrating Plant.
Gardner, Robt., & Son, Montreal.

Concrete Mixers.
A. R. Williams Machy. Co., Toronto.
Can. Fairbanks-Morse Co., Montreal.
National Machinery & Supply Co., Hamilton.
H. W. Petrie, Toronto.

Concrete Reinforcement.
Canada Wire Goods Mfg. Co., Hamilton.

Condensers.
Can. Buffalo Forge Co., Montreal.
Mesta Machine Co., Pittsburg, Pa.
The Smart-Turner Machine Co., Hamilton.
Southwark Foundry & Machine Co., Philadelphia.
Wm. Tod Company, Youngstown, O.

Contracting Engineers, Electrical
Lintz-Porter Co., Toronto.

Controllers and Starters, Electric Motor.
A. R. Williams Machy. Co., Toronto.
H. W. Petrie, Toronto.
Toronto & Hamilton Electric Co., Hamilton, Ont.

Conveyor Machinery.
Heath W. D. & Son, Toronto.
Can. Fairbanks-Morse Co., Montreal.
National Machinery & Supply Co., Hamilton, Ont.
H. W. Petrie, Toronto.
Plessisville Foundry, Plessisville, Que.
The Smart-Turner Machine Co., Hamilton.

Coping Machines.
Can. Buffalo Forge Co., Montreal.
John Bertram & Sons Co., Dundas.
National Machinery & Supply Co., Hamilton, Ont.
Niles-Bement Pond Co., New York.

Cornice Brakes.
Brown Boggs Co., Ltd., Hamilton, Canada.
Steel Bending Brake Wks., Chatham.

Counting Machines.
W. N. Durant Co., Milwaukee, Wis.
National Scale Co., Chicopee Falls, Mass.
C. J. Root Co., Bristol, Conn.

Counterbores and Countersinks.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Machine Co., New Bedford.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co., Greenfield, Mass.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Countershafts.
Baird Machine Co., Bridgeport, Conn.
Wells Bros. Co., Greenfield, Mass.

Country House Lighting and Cooking.
Can. Blaugas Co., Montreal.

Couplings.
Can. H. W. Johns-Manville Co., Ltd., Toronto.
Eastern Machinery Co., New Haven, Conn.
Gardner, Robt., & Son, Montreal.
Owen Sound Iron Works Co., Owen Sound, Ont.

Couplings, Air Hose.
Cleveland Pneumatic Tool Co. of Canada, Toronto.

Crabs, Travelling.
Owen Sound Iron Works Co., Owen Sound.

Cranes, Locomotive.
Northern Crane Works, Walkerville.

Cranes, Gantry.
Northern Crane Works, Walkerville.
Smart-Turner Machine Co., Hamilton, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

Cranes, Goliath.
Herbert Morris Crane & Hoist Co., Ltd., Toronto.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

Cranes, Hydraulic.
Southwark Foundry & Machine Co., Philadelphia.
Watson-Stillman Co., Aldene, N.J.

Cranes, Pneumatic.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

Cranes, Post Jib.
Northern Crane Works, Walkerville.
Smart-Turner Machine Co., Hamilton, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

Cranes, Portable.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

Cranes, Swing Jib.
Northern Crane Works, Walkerville.
Smart-Turner Machine Co., Hamilton, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

Cranes, Transfer.
Northern Crane Works, Walkerville.
Smart-Turner Machine Co., Hamilton, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

Cranes, Wall.
Northern Crane Works, Walkerville.
Smart-Turner Machine Co., Hamilton, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

Cranes, Travelling Electric and Hand Power.
Dominion Bridge Co., Montreal.
Niles-Bement-Pond Co., New York.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

Cranes, All Kinds.
Northern Crane Works, Walkerville.
Owen Sound Iron Works Co., Owen Sound, Ont.
Southwork Foundry & Machine Co., Philadelphia.
Harvey, Ill.
Whiting Foundry Equipment Co.

Crank Pin Turning Machine.
Niles-Bement-Pond Co., New York.

Crimps, Leather.
Graton & Knight Mfg. Co., Montreal.

Cupolas.
Can. Buffalo Forge Co., Montreal.
Northern Crane Works, Walkerville.
H. W. Petrie, Toronto.
Sheldons, Ltd., Galt, Ont.
Whiting Foundry Equipment Co. Harvey, Ill.

Cupola and Blast Gate Blowers.
Can. Sirocco Co., Ltd., Windsor, Ont.

Cupola Blast Gauges & Blowers.
Sheldons, Ltd., Galt, Ont.

Cutters, Angle, Tee Iron and Bar.
Can. Buffalo Forge Co., Montreal.

Cutters, Flue.
Independent Pneumatic Tool Co., Chicago.
Cleveland Pneumatic Tool Co. of Canada, Toronto.

Cutters, Pipe.
Can. Fairbanks-Morse Co., Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Trimont Mfg. Co., Roxbury. Mass.

Cutting Compound & Cutting Oil.
Can. Economic Lubricant Co., Montreal.
Can. Oil Companies, Toronto.
Cataract Refining Co., Buffalo, N.Y.
Crescent Oil Co., New York.
Racine Tool & Machine Co., Racine, Wis.

Cutter Grinders and Attachments.
Cincinnati Milling Machine Co., Cincinnati.
Garvin Machine Co., New York.
Girard Machine & Tool Co., Philadelphia, Pa.

Cutters, Milling.
A. R. Williams Machy. Co., Toronto
Can. Fairbanks-Morse Co., Montreal
Cleveland Twist Drill Co., Cleveland.
Garvin Machine Co., New York.
Morse Twist Drill and Machine Co., New Bedford.
H. W. Petrie, Toronto.
Tabor Mfg. Co., Philadelphia, Pa.
Pratt & Whitney Co., Dundas, Ont.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Cutting-off Machines.
Armstrong Bros. Tool Co., Chicago.
John Bertram & Sons Co., Dundas.
Can. Fairbanks-Morse Co., Montreal.
Espen-Lucas Machine Wks., Philadelphia, Pa.
Foss & Hill Machy. Co., Montreal.
Garlock-Machinery, Toronto.
Garvin Machine Co., New York.
Girard Machine & Tool Co., Philadelphia, Pa.
Geo. Gorton Machine Co., Racine, Wis.
Hurlbut, Rogers Machinery Co., South Sudbury, Mass.
John H. Hall & Sons, Brantford, Ont.
Wm. Kennedy & Sons, Owen Sound, Ont.
Nutter & Barnes Co., Hinsdale, N.H.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont
Tabor Mfg. Co., Philadelphia, Pa.
L. S. Starrett Co., Athol, Mass.

Damper Regulators.
Can. Fairbanks-Morse Co., Montreal.

Derricks.
Dominion Bridge Co., Montreal.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Designers, Special Machinery.
Baird Machine Co., Bridgeport, Conn.

Diamonds, Black.
Geo. A. Jones Co., Ltd., New York.

Diamonds, Rough.
Geo. A. Jones Co., Ltd., New York.

Diamond Tools.
Geo. A. Jones Co., Ltd., New York.

Dies and Die Stocks.
Armstrong Mfg. Co., Bridgeport, Conn.
Banfield, W. H. & Son, Toronto.
Butterfield & Co., Rock Island, Que.
Brown, Boggs & Co., Hamilton, Ont.
Can. Fairbanks-Morse Co., Montreal.
Duncan Electrical Co., Montreal.
Gardner, Robt., & Son, Montreal.
Greenfield Tap & Die Corporation, Greenfield, Mass.
A. B. Jardine & Co., Hespeler, Ont.
Matthews, J. H., & Co., Pittsburg, Pa.
Modern Tool Co., Erie, Pa.
Morse Twist Drill and Machine Co., New Bedford.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.
Wiley & Russell, Greenfield, Mass.

Dies for Bit Brace Use.
Wells Brothers Co., Greenfield, Mass.

Die Sinkers.
Garvin Machine Co., New York.

Dies for Machines.
Wells Brothers Co., Greenfield, Mass.

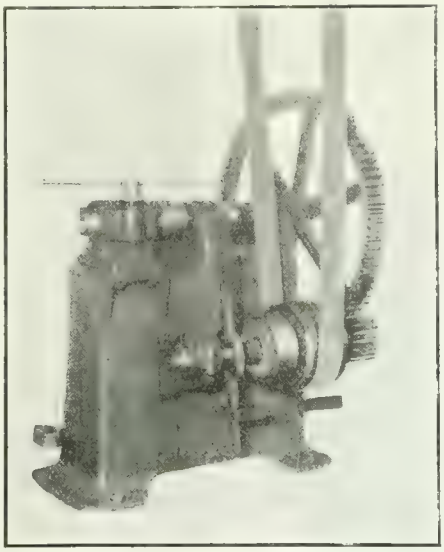
Die Sinking Presses, Hydraulic
Charles F. Elmes Eng. Works, Chicago
Watson-Stillman Co., Aldene, N.J.

Dies, Self-opening.
Geometric Tool Co., New Haven.
Greenfield Tap & Die Corporation, Greenfield, Mass.
Landis Machine Co., Waynesboro, Pa.
Matthews, J. H., & Co., Pittsburg Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit

Holden-Morgan Mechanical Plug Wrench

For Screwing the Base Plugs Into Shells

Output 120 per hour. One machine with an operator will do the work of four men. Friction device adjustable, and can be set for any required tension, and when set the pressure applied will not vary from the desired adjustment.

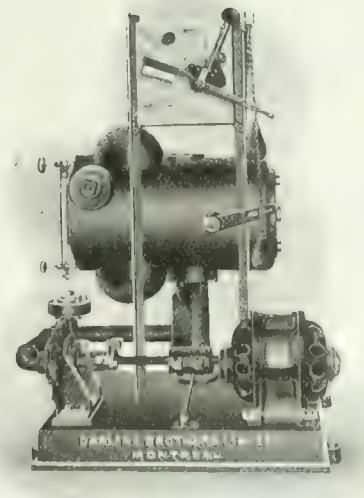


Direct driven, no countershaft needed. The plug is screwed in and tightened up entirely by mechanical action, and therefore eliminating the variations that result from hand work.

THE HOLDEN-MORGAN COMPANY, LIMITED

539 RICHMOND STREET WEST, TORONTO

Top-Notch Power Pump Service



Electrically Controlled Pump and Receiver.

This is the result of every installation of our power pumps.

Our long experience in this work enables us to guarantee first-class service in every respect.

If you are needing or expect to be needing anything in this line, remember **we make them for every service.**

Drop a line to our engineering department—it is in charge of experts who will gladly consult with you with regard to your requirements.

DARLING BROS., LIMITED

Head Office and Works: MONTREAL

WINNIPEG

VANCOUVER TORONTO

Dies, Opening.
W. H. Banfield & Sons, Toronto.
Can. Fairbanks-Morse Co., Montreal.
Duncan Electrical Co., Montreal.
Greenfield Tap & Die Corporation, Greenfield, Mass.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Manning, J. H., & Co., Pittsburg, Pa.
Modern Tool Co., Erie, Pa.
Moreney Machine & Tool Co., Detroit.
Pratt & Whitney Co., Dundas, Ont.

Dies for Screw Plates.
Wells Brothers Co., Greenfield, Mass.

Dies, Sheet Metal Working.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Can.

Dies, Screws and Thread.
Armstrong Mfg. Co., Bridgeport, Conn.
Greenfield Tap & Die Corporation, Greenfield, Mass.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Moreney Machine & Tool Co., Detroit.

Discs, Leather.
Graton & Knight Mfg. Co., Montreal.

Draughtsman's Tools.
Emmert Mfg. Co., Waynesboro, Pa.

Draft, Mechanical.
W. H. Banfield & Sons, Toronto.
Butterfield & Co., Rock Island, Que.
Can. Buffalo Forge Co., Montreal.
Can. Sirocco Co., Windsor, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Pratt & Whitney Co., Dundas, Ont.
Sheldons, Limited, Galt, Ont.

Drill Bolt Cutters.
Cleveland Pneumatic Tool Co. of Canada, Toronto.

Drill Presses.
Baker Bros., Toledo, O.
W. F. & John Barnes Co., Rockford.
Can. Buffalo Forge Co., Montreal.
Colburn Machine Tool Co., Franklin, Pa.
Foss & Hill Machy. Co., Montreal.
Hill, Clarke & Co. of Chicago, Chicago, Ill.
Garvin Machine Co., New York.
Girard Machine & Tool Co., Philadelphia, Pa.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
A. R. Williams Machinery Co., Toronto.

Drilling Machines, Locomotive and Multiple Spindle
Amalgamated Machy. Corporation, Chicago, Ill.
Baker Bros., Toledo, O.
Barnes Drill Co., Rockford, Ill.
John Bertram & Sons Co., Dundas.
Can. Buffalo Forge Co., Montreal.
Can. Fairbanks Morse Co., Montreal.
Colburn Machine Tool Co., Franklin, Pa.
Garlock-Machinery, Toronto.
Garvin Machine Co., New York.
Girard Machine & Tool Co., Philadelphia, Pa.
A. B. Jardine & Co., Hespeler, Ont.
Niles-Bement Pond Co., New York.
H. W. Petrie, Toronto.

Drilling Machines, Radial and Turret.
Baker Bros., Toledo, O.
Barnes Drill Co., Rockford, Ill.
John Bertram & Sons Co., Dundas.
Can. Fairbanks-Morse Co., Montreal.
Motch & Merryweather Machy. Co., Cleveland, O.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Turner Machine Co., Danbury, Conn.

Drilling Machines, Sensitive.
Baker Bros., Toledo, O.
W. F. & John Barnes Co., Rockford.
Can. Fairbanks-Morse Co., Montreal.
Niles-Bement Pond Co., New York.
Rockford Machine Tool Co., Rockford.

Drilling Machines, Upright and Horizontal.
Amalgamated Machy. Corporation, Chicago, Ill.
Baker Bros., Toledo, O.
Barnes Drill Co., Rockford, Ill.
Colburn Mach. Tool Co., Franklin, Pa.
A. R. Williams Machy. Co., Toronto.
W. F. & John Barnes Co., Rockford.
John Bertram & Sons Co., Dundas.
Garlock-Machinery, Toronto.
Girard Machine & Tool Co., Philadelphia, Pa.
A. B. Jardine & Co., Hespeler, Ont.
Rockford Machine Tool Co., Rockford.
R. McDougall Co., Galt.
Motch & Merryweather Machy. Co., Cleveland, O.
Niles Bement-Pond Co., New York.
H. W. Petrie, Toronto.

Drilling Posts.
Keystone Mfg. Co., Buffalo, N.Y.

Drills, Bench.
W. F. & John Barnes Co., Rockford.
Can. Buffalo Forge Co., Montreal.
Can. Fairbanks-Morse Co., Montreal.
Pratt & Whitney Co., Dundas, Ont.
United States Electrical Tool Co., Cincinnati.

Drills, Blacksmith and Bit Stock.
Can. Buffalo Forge Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill and Machine Co., New Bedford.
H. W. Petrie, Toronto.
Wilt Twist Drill Co., of Canada, Ltd., Walkerville, Ont.

Drills, Centre.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill and Machine Co. New Bedford.
Pratt & Whitney Co., Dundas, Ont.
L. S. Starrett Co., Athol, Mass.
Wilt Twist Drill Co., of Canada, Ltd., Walkerville, Ont.

Drills Corner (Pneumatic).
Cleveland Pneumatic Tool Co. of Canada, Toronto.

Drills, Electric and Portable.
A. R. Williams Machy. Co., Toronto.
Can. Buffalo Forge Co., Montreal.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Stow Mfg. Co., Binghamton, N.Y.
United States Electrical Tool Co., Cincinnati, O.

Drills, High Speed.
Baker Bros., Toledo, O.
Cleveland Twist Drill Co., Cleveland.
Can. Fairbanks Morse Co. Montreal.
H. A. Dimy Co., Montreal.
Morse Twist Drill and Machine Co., New Bedford.
W. F. & John Barnes Co., Rockford, Ill.
McKenna Bros. Brass Co., Pittsburg, Pa.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.
Wilt Twist Drill Co., of Canada, Ltd., Walkerville, Ont.

Drills, Multiple Spindle.
Pratt & Whitney Co., Dundas, Ont.
Niles-Bement-Pond Co., New York.

Drills, Oil Tube.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill and Machine Co. New Bedford.

Drills, Pneumatic.
John F. Allen Co., New York.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Independent Pneumatic Tool Co., Chicago, Ill.
Niles-Bement-Pond Co., New York.

Drills, Ratchet and Hand.
Armstrong Bros. Tool Co., Chicago.
Can. Buffalo Forge Co., Montreal.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill and Machine Co., New Bedford.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Drills, Rock.
A. R. Williams Machy. Co., Toronto
Cleveland Pneumatic Tool Co. of Canada Toronto.

Drills, Reamer.
McKenna Bros. Brass Co., Pittsburg, Pa.

Drills, Track.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill and Machine Co., New Bedford.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Drills, Twist.
Armstrong, Whitworth of Canada, Ltd., Montreal.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
John Morrow Screw Co., Ingersoll, Ont.
Morse Twist Drill and Machine Co., New Bedford.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Drill Holders.
Wells Brothers Co., Greenfield, Mass.

Drill Sockets.
Modern Tool Co., Erie, Pa.
Morse Twist Drill and Machine Co., New Bedford.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Drinking Fountains.
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

Drying Appliances.
Can. Buffalo Forge Co., Montreal.
Can. Sirocco Co., Ltd., Windsor, Ont.
Sheldons Ltd., Galt, Ont.

Drying Out Barrels.
Baird Machine Co., Bridgeport, Conn.

Drying Ovens.
Oven Equipment & Mfg. Co., New Haven, Conn.
Whiting Foundry Equipment Co., Harvey, Ill.

Dump Cars.
Can. Fairbanks-Morse Co., Montreal.
National Machinery & Supply Co., Hamilton, Ont.
Owen Sound Iron Works Co., Owen Sound.
Plessisville Foundry, Plessisville, Que.

Dust Separators.
Can. Buffalo Forge Co., Montreal.
Sheldons, Ltd., Galt, Ont.

Dust Arresters (for Tumbling Mills).
Northern Crane Works, Ltd., Walkerville, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

Dynamos and Electrical Supplies.
A. R. Williams Machy. Co., Toronto.
Can. Fairbanks-Morse Co., Montreal.
Lancashire Dynamo and Motor Co., Ltd., Toronto.
H. W. Petrie, Toronto.
Toronto & Hamilton Electric Co., Hamilton, Ont.

Electrical Supplies.
Duncan Electrical Co., Montreal.
Lintz-Porter Co., Toronto.

Elevator Enclosures.
Canada Wire & Iron Goods Co., Hamilton, Ont.
Dennis Wire & Iron Works, London Ont.

Elevating and Conveying Machinery.
Can. Mathews Gravity Co., Toronto.
Plessisville Foundry, Plessisville, Que.

Emery Grinders (Pneumatic).
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Stow Mfg. Co., Binghamton, N.Y.

Emery and Emery Wheels.
Can. Fairbanks-Morse Co., Montreal.
Canadian Hart Wheels, Hamilton, Ont.
Ford-Smith Machine Co., Hamilton.
Garvin Machine Co., New York.
Girard Machine & Tool Co., Philadelphia, Pa.
H. W. Petrie, Toronto.
Stevens, F. B., Detroit, Mich.

Emery Wheels, Dressers and Stands.
Canadian Hart Wheels, Hamilton, Ont.
Gardner, Robt., & Son, Montreal.
General Supply Co. of Canada, Ltd., Ottawa.
National Machinery & Supply Co. Hamilton, Ont.
Norton Co., Worcester, Mass.
H. W. Petrie, Toronto.

Emery Wheel Safety Flanges.
Canadian Hart Wheels, Hamilton, Ont.

Enameling Ovens.
Oven Equipment & Mfg. Co., New Haven, Conn.

Engines, Corliss, Compound, Pumping.
Mesta Machine Co., Pittsburg, Pa.
Wm. Tod Company, Youngstown, O.

Engines, Gas and Gasoline.
Can. Fairbanks-Morse Co., Montreal.
Jones & Glassco, Montreal.
Mesta Machine Co., Pittsburg, Pa.
National Machinery & Supply Co., Hamilton.
H. W. Petrie, Toronto.
Wm. Tod Company Youngstown, O.

Engines, Horizontal and Vertical.
Can. Buffalo Forge Co., Montreal.
Can. Sirocco Co., Ltd., Windsor, Ont.
Mesta Machine Co., Pittsburg, Pa.
H. W. Petrie, Toronto.
Sheldons, Ltd., Galt, Ont.
A. R. Williams Machy. Co., Toronto.
Wm. Tod Co., Youngstown, O.

Engines, High-Speed, Automatic.
Can. Buffalo Forge Co., Montreal.

Engines, Steam.
Can. Buffalo Forge Co., Montreal.
General Supply Co. of Canada, Ltd., Ottawa.
Mesta Machine Co., Pittsburg, Pa.
H. W. Petrie, Toronto.
Plessisville Foundry, Plessisville, Que.
Southwark Foundry & Machine Co., Philadelphia, Pa.
Wm. Tod Company, Youngstown, O.

Engines, Stationary and Marine.
Southwark Foundry & Machine Co., Philadelphia, Pa.

Engineering Books.
The MacLean Publishing Co., Ltd., Toronto.

Engraving Machines.
Geo. Gorton Machine Co., Racine, Wis.

Elevators and Buckets.
Eastern Machinery Co., New Haven, Conn.
Whiting Foundry Equipment Co., Harvey, Ill.

Equipment Shop.
Baird Machine Co., Bridgeport, Conn.
Garvin Machine Co., New York.
Wm. Tod Co., Youngstown, O.

Escutcheon Pins.
Parmenter & Bulloch Co., Gananoque.

Evaporators' Machinery.
Brown, Boggs & Co., Hamilton, Can.

Exhaust Heads and Hoods.
Can. Buffalo Forge Co., Montreal.
Can. Steel Products Co., Montreal.
Can. Fairbanks Morse Co., Montreal.
Sheldons, Ltd., Galt, Ont.

Exhausters.
Can. Buffalo Forge Co., Montreal.
Can. Sirocco Co. Ltd., Windsor, Ont.
H. W. Petrie, Toronto.

Experimental Machinery.
Owen Sound Iron Works Co., Owen Sound.

Extractors, Ingot.
Mesta Machine Co., Pittsburg, Pa.

Fans.
Can. Buffalo Forge Co., Berlin, Ont.
Baird Machine Co., Bridgeport, Conn.
Can. Sirocco Co., Ltd., Windsor, Ont.
Lintz-Porter Co., Toronto.
Plessisville Foundry, Plessisville, Que.
Sheldons, Ltd., Galt, Ont.
The Smart-Turner Machine Co., Hamilton.

Faucets.
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

Feed Water Heaters.
Can. Fairbanks-Morse Co., Montreal.
The Smart-Turner Machine Co., Hamilton.

Fence, Iron Factory.
Canada Wire & Iron Goods Co., Hamilton, Ont.
Dennis Wire & Iron Works Co., Ltd., London, Canada.
Standard Tube & Fence Co., Woodstock, Ont.

Files.
Delta File Works, Philadelphia, Pa.
Nicholson File Co., Port Hope, Ont.

Fire Alarm Apparatus.
Lintz-Porter Co., Toronto.

Fire Brick.
Elk Fire Brick Co., Hamilton, Ont.

Fire Extinguishers.
Can. H. W. Johns-Manville Co., Limited, Toronto.
General Supply Co. of Canada, Ltd., Ottawa.

Fire Escapes.
Canada Wire & Iron Goods Co., Hamilton, Ont.
Dennis Wire & Iron Works, London, Ont.

Flash Lamps.
Lintz-Porter Co., Toronto.

Flexible Shafts.
Chicago Flexible Shaft Co., Chicago.
Stow Mfg. Co., Binghamton, N.Y.

Flumes.
Toronto Iron Works, Ltd., Toronto.

Foot Valves.
Smart-Turner Mach. Co., Hamilton.

Forges, Hand, etc.
Can. Buffalo Forge Co., Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.
National Machinery & Supply Co. Hamilton.
Sheldons, Limited, Galt, Ont.

Forgings, Drop, Automobile and Locomotive.
Bliss, E. W., Co., Brooklyn, N.Y.
Canadian Billings & Spencer, Ltd., Welland.
Dominion Forge & Stamping Co., Walkerville, Ont.
Mesta Machine Co., Pittsburg, Pa.
Steel Co. of Canada, Hamilton, Ont.
J. H. Williams Co., Brooklyn, N.Y.

Forging Hammers, Belt-Driven.
Bliss, E. W., Co., Brooklyn, N.Y.
Plessisville Foundry, Plessisville, Que.

Forging Hammers, Steam.
Erie Foundry Co., Erie, Pa.

Forging Machinery.
John Bertram & Sons Co., Dundas.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
National Machinery Co., Tiffin, Ohio.
H. W. Petrie, Toronto.
Plessisville Foundry Plessisville, Que.
Steel Co. of Canada, Hamilton, Ont.
Wm. Tod Company, Youngstown, O.
Watson-Stillman Co., Aldene, N.J.
Williams, White & Co., Moline, Ill.

Foundry Equipment.
Northern Crane Works, Walkerville.
W. W. Sly Mfg. Co., Cleveland, O.
Whiting Foundry Equipment Co., Harvey, Ill.

Friction Leathers.
Graton & Knight Mfg. Co., Montreal.

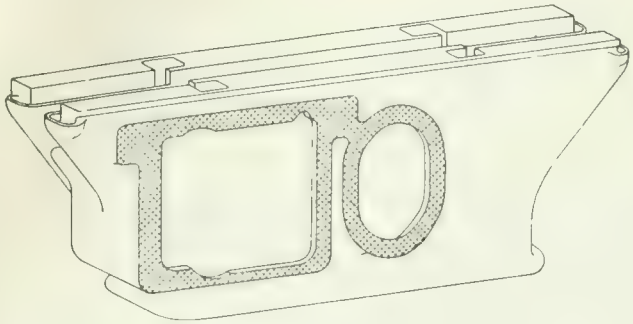
Friction Clutch Pulleys, etc.
American Pulley Co., Philadelphia, Pa.
Baird Machine Co., Bridgeport, Conn.
Eastern Machinery Co., New Haven, Conn.
Owen Sound Iron Works Co., Owen Sound.
H. W. Petrie, Toronto.
Positive Clutch & Pulley Works, Toronto.

Furnace Engineers and Contractors.
Mechanical Engineering Co., Montreal.
Whiting Foundry Equipment Co., Harvey, Ill.

Furnaces, Blast.
Toronto Iron Works, Ltd., Toronto.

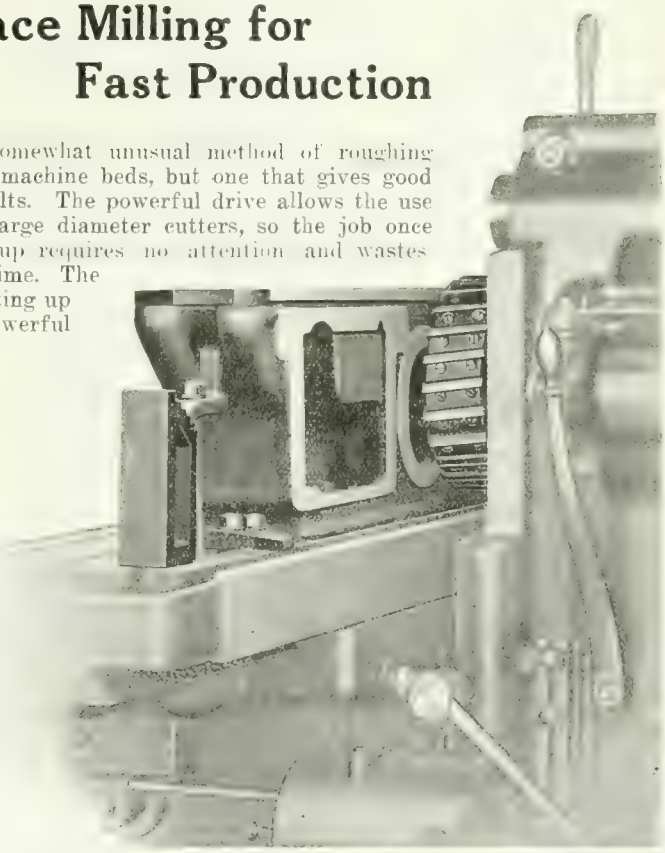
Furnaces, Oil, Coal, Gas and Electric.
Canadian Hoskins, Limited, Walkerville, Ont.
Chicago Flexible Shaft Co., Chicago, Ill.
Mechanical Engineering Co., 55 Cote St., Montreal, Que.
H. W. Petrie Toronto.
Tate, Jones & Co., Pittsburgh, Pa.
Whiting Foundry Equipment Co., Harvey, Ill.

Furnaces, Steel Heating and Brass Melting.
Can. Hoskins, Ltd., Walkerville, Ont.
Chicago Flexible Shaft Co., Chicago, Ill.
Mechanical Engineering Co., 55 Cote St., Montreal, Que.
Northern Crane Works, Ltd., Walkerville, Ont.
Tate, Jones & Co., Pittsburgh, Pa.
Whiting Foundry Equipment Co. Harvey, Ill.



Face Milling for Fast Production

A somewhat unusual method of roughing out machine beds, but one that gives good results. The powerful drive allows the use of large diameter cutters, so the job once set up requires no attention and wastes no time. The castings are lined up against a parallel, with no time lost setting up for depth of cut. Don't you have simi'ar work on which a powerful milling machine will effect a considerable saving?



B. & S. Milling Machines for Heavy Service

They have the power you need on the big jobs, backed up with sturdy construction which allows you to use that power for all it is worth. They are machines that produce results. Write us for literature on our entire line.

Brown & Sharpe Mfg. Co.

PROVIDENCE, R.I., U.S.A.

Canadian Agents:
The CANADIAN FAIRBANKS-MORSE CO., Ltd.
Toronto Montreal Winnipeg Calgary
Vancouver St. John Ssskatoon

SHEET METAL STAMPINGS

The Dominion Forge & Stamping Co., Limited

WALKERVILLE ONTARIO

Our facilities and equipment enable us to give you a top-notch quality at a very reasonable price.

DROP FORGINGS

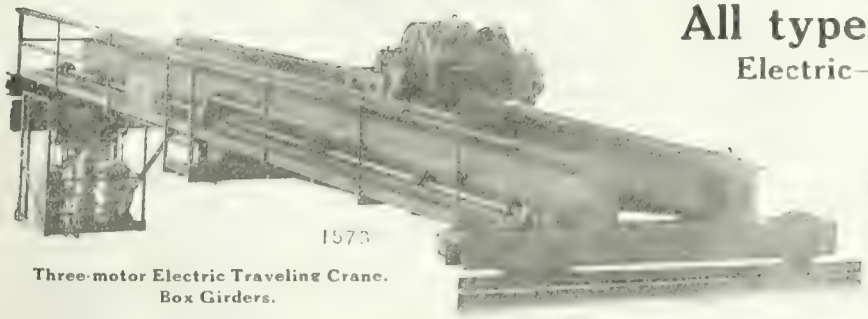
AUTOMOBILE FENDERS, HOODS AND GASOLINE TANKS

Whiting Traveling Cranes

All types for every service

Electric—Pneumatic—Handpower

Complete Foundry Plants designed installed and put into operation



Three-motor Electric Traveling Crane. Box Girders.

WHITING FOUNDRY EQUIPMENT CO. HARVEY-ILL. U.S.A. CHICAGO SUBURB

Send for Catalog

Furnaces, Heat Treating, Hardening and Tempering.
Can. Hoskins, Ltd., Walkerville, Ont.
Chicago Flexible Shaft Co., Chicago, Ill.
Mechanical Engineering Co., 55 Cote St., Montreal, Que.
Northern Crane Works, Ltd., Walkerville, Ont.
Tate, Jones & Co., Pittsburgh, Pa.
Whiting Foundry Equipment Co., Harvey, Ill.

Furnaces, Forging.
Mechanical Engineering Co., Montreal.
Northern Crane Works, Ltd., Walkerville, Ont.
Whiting Foundry Equipment Co. Harvey, Ill.

Furnaces, Annealing, etc.
Can. Hoskins, Ltd., Walkerville, Ont.
Chicago Flexible Shaft Co., Chicago, Ill.
Mechanical Engineering Co., 55 Cote St., Montreal, Que.
Northern Crane Works, Ltd., Walkerville, Ont.
Tate, Jones & Co., Pittsburgh, Pa.
Whiting Foundry Equipment Co., Harvey, Ill.

Furnaces for Baking, Bluing, Drying, Enameling, Japanning and Lacquering.
Mechanical Engineering Co., Montreal.
Oven Equipment & Mfg. Co., New Haven, Conn.

Furnace Lining.
Can. H. W. Johns-Manville Co., Limited, Toronto.
Mechanical Engineering Co., Montreal.

Fuse Boxes, Steel.
Dominion Forge & Stamping Co., Walkerville, Ont.

Fuse Cap Machinery.
Noble & Westbrook Mfg. Co., Hartford, Conn.

Gang Planer Tools.
Armstrong Bros. Tool Co., Chicago.

Gaskets, Leather, etc.
Graton & Knight Mfg. Co., Montreal.
Can. H. W. Johns-Manville Co., Limited, Toronto.

Gas Blowers and Exhausters.
Can. Buffalo Forge Co., Montreal.
Can. Sirocco Co., Ltd., Windsor, Ont.
Sheldons, Limited, Galt.
Southwark Foundry & Machine Co., Philadelphia, Pa.

Gas Burners.
Oven Equipment & Mfg. Co., New Haven, Conn.

Gas Machines.
Brown, Boggs & Co., Hamilton, Can

Gas Producer Plants.
Can. Fairbanks-Morse Co., Montreal.

Gauges, Hydraulic Pressure.
Charles F. Elmes Eng. Works, Chicago
Watson-Stillman Co., Aldene, N.J.

Gauges, Standard.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Greenfield Tap & Die Corporation, Greenfield, Mass.
Holden-Morgan Co., Toronto.
Morse Twist Drill and Machine Co., New Bedford.
Pratt & Whitney Co., Hartford, Conn.
Garvin Machine Co., New York.
National Machinery & Supply Co., Hamilton.
Southwark Foundry & Machine Co., Philadelphia.

Gear-Cutting Machinery.
Girard Machine & Tool Co., Philadelphia, Pa.
Hamilton Gear & Machine Co., Toronto.
Hill, Clarke & Co., of Chicago, Chicago, Ill.
Motch & Merryweather Machy. Co., Cleveland, O.
National Machinery & Supply Co., Hamilton.
H. W. Petrie, Toronto.
Sheldons, Limited, Galt, Ont.
The Smart-Turner Machine Co., Hamilton.
Wm. Tod Co., Youngstown, O.
D. E. Whiton Machine Co., New London, Conn.
A. R. Williams Machy. Co., Toronto.

Gears, Cut, Mortise, Angle, Worm.
Gardner, Robt., & Son, Montreal.
Hamilton Gear & Machine Co., Toronto.
Hull Iron & Steel Foundries, Ltd., Hull, Quebec.
Jones & Glassco, Montreal, P.Q.
Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.
Mesta Machine Co., Pittsburg, Pa.
Philadelphia Gear Works, Philadelphia, Pa.
Smart-Turner Machine Co., Hamilton, Ont.
Wm. Tod Co., Youngstown, O.

Gears, Rawhide.
Hamilton Gear & Machine Co., Toronto.
Gardner, Robt., & Son, Montreal.
Jones & Glassco, Montreal, P.Q.
Philadelphia Gear Works, Philadelphia, Pa.
Smart-Turner Machine Co., Hamilton, Ont.

Generators, Electric.
A. R. Williams Machy. Co., Toronto.
Can. Fairbanks-Morse Co., Montreal.
Lancashire Dynamo and Motor Co., Ltd., Toronto.
H. W. Petrie, Toronto.
Toronto and Hamilton Electric Co., Hamilton.

Grain for Polishing.
Norton Co., Worcester, Mass.

Graphite.
Can. H. W. Johns-Manville Co., Ltd., Toronto.
Jos. Dixon Crucible Co., Jersey City.
Stevens, F. B., Detroit, Mich.

Greases.
Can. Economic Lubricant Co., Montreal.

Grinders, Automatic Knife.
W. H. Banfield & Son, Toronto.

Grinders, Centre, Pedestal and Bench.
Canadian Hart Wheels, Ltd., Hamilton, Ont.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Ford-Smith Machine Co., Hamilton.
Foss & Hill Machy. Co., Montreal.
Gray Mfg & Machine Co., Toronto.
Niles-Rement-Pond Co., New York.
Modern Tool Co., Erie, Pa.
Morse Twist Drill and Machine Co., New Bedford.
New Britain Machine Co., New Britain, Conn.
Norton Grinding Co., Worcester, Mass.
H. W. Petrie, Toronto.
Stow Mfg. Co., Binghamton, N.Y.
United States Electrical Tool Co., Cincinnati, O.

Grinders, Cutter.
Brown & Sharpe Mfg. Co., Providence, R.I.
Foss & Hill Machy. Co., Montreal.
Greenfield Machine Co., Greenfield, Mass.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.

Grinders, Die Chaser.
Bignall & Keeler Mfg. Co., Edwardsville, Ill.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.

Grinders, Disk.
Armstrong Bros. Tool Co., Chicago, Ill.
Gardner Machine Co., Beloit, Wis.
Norton Grinding Co., Worcester, Mass.

Grinders, Drill.
Garvin Machine Co., New York.
United States Electric Tool Co., Cincinnati, O.

Grinders, Cylinder, Internal.
Brown & Sharpe Mfg. Co., Providence, R.I.
Foss & Hill Machy. Co., Montreal.
Girard Machine & Tool Co., Philadelphia, Pa.
Grant Mfg. & Machine Co., Bridgeport, Conn.
Greenfield Machine Co., Greenfield, Mass.
Hill, Clarke & Co. of Chicago, Chicago, Ill.
Landis Tool Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Motch & Merryweather Machy. Co., Cleveland, O.
Norton Grinding Co. Worcester, Mass.
H. W. Petrie, Toronto.

Grinders, Electric.
Lintz-Porter Co., Toronto

Grinders, Pneumatic.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Independent Pneumatic Tool Co., Chicago, Ill.

Grinders, Portable, Electric, Hand, Tool, Post, Floor and Bench.
Baird Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Foss & Hill Machy. Co., Montreal.
Grant Mfg. & Machine Co., Bridgeport, Conn.
Greenfield Machine Co., Greenfield, Mass.
Hill, Clarke & Co. of Chicago, Chicago, Ill.
Landis Tool Co., Waynesboro, Pa.
Motch & Merryweather Machy. Co., Cleveland, O.
Norton Co., Worcester, Mass.
H. W. Petrie, Toronto.
United States Electrical Tool Co., Cincinnati.
A. R. Williams Machy. Co., Toronto.

Grinders, Swing, Portable, Electric
United States Electrical Tool Co., Cincinnati.

Grinders, Tool and Holders.
Armstrong Bros. Tool Co., Chicago.
W. F. & John Barnes Co., Rockford, Ill.
Blount, J. G., & Co., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Greenfield Machine Co., Greenfield Mass.
Hill, Clarke & Co. of Chicago, Chicago, Ill.
Motch & Merryweather Machy. Co. Cleveland, O.
Tabor Mfg. Co., Philadelphia, Pa.

Grinders, Universal, Plain.
Girard Machine & Tool Co., Philadelphia, Pa.
Landis Tool Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.

Grinders, Vertical Surface.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Montreal.
Girard Machine & Tool Co., Philadelphia, Pa.
Pratt & Whitney Co., Dundas, Ont.

Grinding and Polishing Machines, Portable, Pneumatic and Spring Frame.
Can. Fairbanks-Morse Co., Montreal.
Canadian Hart Wheels, Ltd., Hamilton, Ont.
Gardner, Robt., & Son, Montreal.
Garvin Machine Co., New York.
Girard Machine & Tool Co., Philadelphia, Pa.
Gray Mfg. & Machine Co., Toronto.
Greenfield Machine Co., Greenfield, Mass.
Hall & Sons, John H., Brantford.
Hill, Clarke & Co. of Chicago, Chicago, Ill.
Motch & Merryweather Machy. Co. Cleveland, O.
Niles-Bement-Pond Co., New York.
Norton Co., Worcester, Mass.
H. W. Petrie, Toronto.
Stow Mfg. Co., Binghamton, N.Y.

Grinding Wheels.
Can. Fairbanks-Morse Co., Montreal
Canadian Hart Wheels, Ltd., Hamilton, Ont.
Carborundum Co., Niagara Falls.
Ford-Smith Machine Co., Hamilton, Canada.
Gray Mfg. & Machine Co., Toronto.
Norton Co., Worcester, Mass.
H. W. Petrie, Toronto.

Guards, Window and Machine.
Canada Wire & Iron Goods Co., Hamilton, Ont.
Dennis Wire & Iron Works Co., Ltd., London, Canada.

Hack Saw Blades.
E. C. Atkins & Co., Hamilton, Ont.
Victor Saw Works, Ltd., Hamilton, Canada.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Racine Tool & Machine Co., Racine, Wis.
L. S. Starrett Co., Athol, Mass.

Hack Saw Frames.
Ford-Smith Machine Co., Hamilton, Canada.
Garvin Machine Co., New York City.

Hammer High Speed.
High Speed Hammer Co., Rochester, N.Y.

Hammers, Drop and Belt Driven.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Canadian Billings & Spencer, Ltd., Welland.
A. R. Jardine & Co., Hespeler, Ont.
Girard Machine & Tool Co., Philadelphia, Pa.
National Machinery & Supply Co., Hamilton.
Niles-Rement-Pond Co., New York.
Plessisville Foundry, Plessisville, Que.
Toledo Machine & Tool Co., Toledo.

Hammers, Helve Power.
West Tire Setter Co., Rochester, N.Y.

Hammers, Pneumatic.
Cleveland Pneumatic Tool Co., of Canada, Toronto.

Hammers, Steam.
John Bertram & Sons Co., Dundas.
Girard Machine & Tool Co., Philadelphia, Pa.
National Machinery & Supply Co., Hamilton.
Niles-Rement-Pond Co., New York.

Hand Hoists & Trolleys.
Whiting Foundry Equipment Co., Harvey, Ill.

Hand Leathers or Pads.
Graton & Knight Mfg. Co., Montreal.

Hangers.
Baird Machine Co., Bridgeport, Conn.
Gardner, Robt., & Son, Montreal.
General Supply Co. of Canada, Ltd., Ottawa.
H. W. Petrie, Toronto.
The Smart-Turner Machine Co., Hamilton.

Hardness Testing Instruments.
Shore Instrument & Mfg. Co., New York.

Heating and Ventilating Engineers.
Can. Buffalo Forge Co., Montreal.
Can. Sirocco Co., Ltd., Windsor, Ont.
Sheldons, Ltd., Galt, Ont.

Heat Gauges, Hardening and Annealing.
Shore Instrument & Mfg. Co., New York.

Hide ...
L. S. Tarshis & Sons, Montreal.

Hinge Machinery.
Baird Machine Co., Bridgeport, Conn.

Hinges.
London Bolt & Hinge Works, London, Ont.

Hoists, Hydraulic.
Southwark Foundry & Machine Co., Philadelphia.
Watson-Stillman Co., Aldene, N.J.

Hoisting and Conveying Machinery.
Beath, W. D., & Son, Toronto.
General Supply Co. of Canada, Ltd., Ottawa.
Northern Crane Works, Walkerville.
Owen Sound Iron Works Co., Owen Sound.
Southwark Foundry & Machine Co., Philadelphia.
Whiting Foundry Equipment Co., Harvey, Ill.

Hoists, Chain, Electric and Pneumatic.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

Hoists, Electric.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

Hoppers.
Toronto Iron Works, Ltd., Toronto.

Hose Clamp Tool.
Cleveland Pneumatic Tool Co. of Canada, Toronto.

Hose, Pneumatic.
Cleveland Pneumatic Tool Co., of Canada, Toronto.

Hose, Steam, Suction and Water.
Can. H. W. Johns-Manville Co., Limited, Toronto.
F. Reddaway & Co., Montreal.

Holders for Dies and Drills.
Wells Brothers, Company, Greenfield, Mass.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Horsehair.
L. S. Tarshis & Sons, Montreal.

Hydraulic Accumulators.
Can. Boomer & Boschert Press Co., Montreal.
Can. Fairbanks-Morse Co., Montreal.
Mesta Machine Co., Pittsburgh.
Niles-Bement-Pond Co., New York.
William R. Perrin, Ltd., Toronto.
The Smart-Turner Machine Co., Hamilton
Southwark Foundry & Machine Co., Philadelphia.
Watson-Stillman Co., Aldene, N.J.

Hydraulic Machinery.
Can. Boomer & Boschert Press Co., Montreal.
Charles F. Elmes Eng. Works, Chicago.
Mesta Machine Co., Pittsburgh.
Niles-Bement-Pond Co., New York.
National Machinery & Supply Co., Hamilton.
William R. Perrin, Ltd., Toronto.
H. W. Petrie, Toronto.
Southwark Foundry & Machine Co., Philadelphia.
Wm. Tod Co., Youngstown, O.
Watson-Stillman Co., Aldene N.J.
Wood, R. D., & Co., Philadelphia.

Indicators, Speed.
Brown & Sharpe Mfg. Co., Providence, R.I.
L. S. Starrett Co., Athol, Mass.

Index Centres.
Fred. C. Dickow, Chicago, Ill.
Garvin Machine Co., New York.

Ingot Metals.
A. C. Leslie & Co., Ltd., Montreal.

Intensifiers.
Mesta Machine Co., Pittsburg, Pa.
Southwark Foundry & Machine Co., Philadelphia.

Iron Filler.
Can. H. W. Johns-Manville Co., Ltd., Toronto.

Iron Ore.
Hanna & Co., M. A., Cleveland, O.

Jacks, Hydraulic.
Charles F. Elmes Eng. Works Chicago
Southwark Foundry & Machine Co., Philadelphia.
Watson-Stillman Co., Aldene, N.J.

Jacks.
Can. Fairbanks-Morse Co., Montreal.
Northern Crane Works, Walkerville.
Norton, A. O., Coaticook, Que.
H. W. Petrie, Toronto.
Plessisville Foundry, Plessisville, Que.

Jacks, Pneumatic.
Northern Crane Works, Walkerville.

Jacks, Pit and Track.
Can. Fairbanks-Morse Co., Montreal.
Northern Crane Works, Walkerville.
Watson-Stillman Co., Aldene, N.J.

Japanning Ovens.
Oven Equipment & Mfg. Co., New Haven, Conn.

Jaws, Face Plate.
Cushman Chuck Co., Hartford, Conn.
Skinner Chuck Co., New Britain, Conn.

REPUTATION

FOR WORK DONE AND BEING DONE IS WHAT INFLUENCES TOOL BUYERS

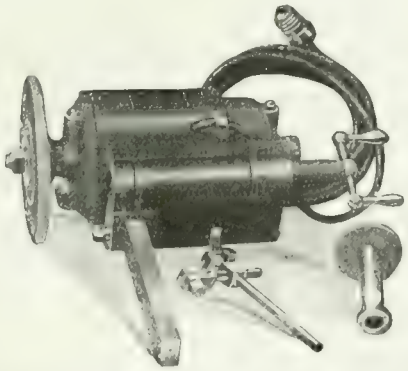
"MORSE" DRILLS

HAVE AN EARNED REPUTATION AS PRODUCERS OF RESULTS. YOU HAVE UNDOUBTEDLY HEARD OF THEM, BUT IF YOU ARE NOT USING THEM YOU ARE MAKING A BIG MISTAKE. ASK ANY MAN WHO DOES.

MORSE TWIST DRILL AND MACHINE COMPANY
NEW BEDFORD **MASS.**

Stow Tool Post Grinder

Does the most accurate of work—patent bearings, for Internal and Surface Grinding — A.C. or D.C. Immediate shipment from stock. Plain or with slide.



One of the many electric portable tools built by

Stow Manufacturing Co.
Binghamton, N.Y.

Oldest portable tool manufacturers in America.
London Stock, 85 Queen Victoria St.

16 in. Lever POST DRILL

A Giant Little Machine For Light Drilling.

Will drill up to 7/8 inch.

The Feed Lever Socket is adjustable on the feed shaft, to provide for setting the lever in the most convenient position for the operator.

An adjustable friction is provided for the feed shaft, which acts as a balance to the weight of the spindle.

Bevel Gears, Feed Pinion and Rack are all machine cut, working smoothly and without noise.

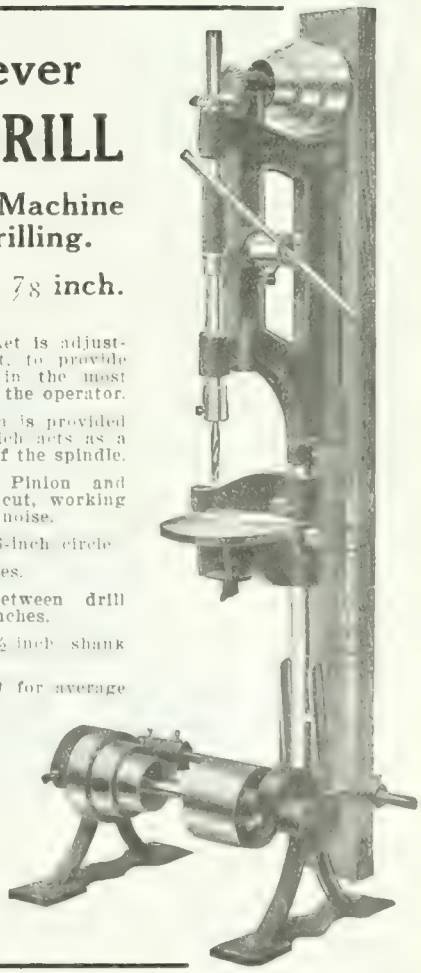
Drills to centre of 16-inch circle

Run of feed 5¼ inches.

Greatest distance between drill spindle and table, 23 inches.

Spindle bored for ½ inch shank twist drills.

Speed of countershaft for average work, 300 per minute.



A. B. Jardine & Co.
Hespeler, Ontario

The advertiser would like to know where you saw his advertisement—tell him.

Jigs, Tools, etc.
Hamilton Gear & Machine Co., Toronto.

Key Seaters.
Baker Bros., Toledo, O.
Garvin Machine Co., New York.
Morton Mfg. Co., Muskegon Heights Mich.
A. R. Williams Machy. Co., Toronto.

Kilns.
Can. Buffalo Forge Co., Montreal.
Sheldons, Limited, Galt, Ont.

Laboratories, Inspection and Testing.
Can. Inspection & Testing Laboratories, Ltd., Montreal.

Lacquering Ovens.
Oven Equipment & Mfg. Co., New Haven, Conn.

Ladles Foundry.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

Lag Screw Gimlet Pointers.
National Machy. Co., Tiffin, Ohio.

Lamps, Arc and Incandescent.
Can. Fairbanks-Morse Co., Montreal.
Can. H. W. Johns-Manville Co., Limited, Toronto.
Ker & Goodwin Brantford.

Lamps, Tungsten.
Lintz-Porter Co., Toronto.

Lathe Chucks.
Ker & Goodwin, Brantford.

Lathe Attachment for Shells.
Lymburner, Ltd., Montreal.

Lathes, Automatic.
Windsor Machine Co., Windsor, Vt.

Lathe Dogs and Attachments.
Armstrong Bros. Tool Co., Chicago.
Fay & Scott, Dexter, Maine.
Hendey Machine Co., Torrington, Conn.
National Forge & Tool Co., Erie, Pa.
J. H. Williams Co., Brooklyn, N.Y.

Lathes, Bench
W. F. & John Barnes Co., Rockford.
Blount, J. G., & Co., Everett, Mass.
Can. Fairbanks-Morse Co., Montreal.
Pratt & Whitney Co., Dundas, Ont.

Lathes, Band Turning.
Jenckes Machine Co., Sherbrooke, Que.

Lathes, Engine.
Amalgamated Machy. Corporation, Chicago, Ill.
A. R. Williams Machy. Co., Toronto.
W. F. & John Barnes Co., Rockford, Ill.
John Bertram & Sons Co., Dundas.
Can. Fairbanks-Morse Co., Montreal.
Cincinnati Iron & Steel Co., Cincinnati, O.
Fay & Scott, Dexter, Maine.
Foss & Hill Machy. Co., Montreal.
Gardner Robt. & Son, Montreal.
Garlock-Machinery, Toronto.
Garvin Machine Co., New York.
Girard Machine & Tool Co., Philadelphia, Pa.
Hendey Machine Co., Torrington, Conn.
Hill, Clarke & Co., of Chicago, Chicago, Ill.
R. McDougall Co., Galt.
Motch & Merryweather Machy. Co., Cleveland, O.
Niles Bement Pond Co., New York.
Oliver Machinery Co., Grand Rapids, Mich.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.

Lathe Pans
New Britain Machine Co., New Britain, Conn.

Lathes, Patternmakers'.
J. G. Blount Co., Everett, Mass.
Fay & Scott, Dexter, Maine
Foss & Hill Machy. Co., Montreal.
Garlock-Machinery, Toronto.
H. W. Petrie, Toronto.

Lathes, Roll Turning
Mesta Machine Co., Pittsburgh.

Lathes, Screw Cutting.
A. R. Williams Machy. Co., Toronto.
John Bertram & Sons Co., Dundas.
Cincinnati Iron & Steel Co., Cincinnati, O.
Girard Machine & Tool Co., Philadelphia, Pa.
Motch & Merryweather Machy. Co., Cleveland, O.
Niles Bement Pond Co., New York.
H. W. Petrie, Toronto.

Lathes, Spinning.
Bliss E. W. Co., Brooklyn, N.Y.
Toledo Mach. & Tool Co., Toledo, O.

Lathe, Turret and Speed.
John Bertram & Sons Co., Dundas.
Blount, J. G. & Co., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
Cincinnati Iron & Steel Co., Cincinnati, O.
Colburn Machine Tool Co., Franklin Pa.
Fay & Scott, Dexter, Maine.
Foss & Hill Machy. Co., Montreal
Garlock-Machinery, Toronto.
Garvin Machine Co., New York.
Girard Machine & Tool Co., Philadelphia, Pa.
Motch & Merryweather Machy. Co., Cleveland, O.
New Britain Machine Co., New Britain, Conn.
Niles-Bement-Pond Co., New York.
Oliver Machinery Co., Grand Rapids, Mich.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.
Warner & Swasey Co., Cleveland, O.
Windsor Machine Co., Windsor, Vt.
A. R. Williams Machy. Co., Toronto.

Leather Strapping.
Graton & Knight Mfg. Co., Montreal.

Lifts, Pneumatic.
Whiting Foundry Equipment Co., Harvey, Ill.

Lighting Fixtures.
Lintz-Porter Co., Toronto.

Link Belting.
Can. Fairbanks-Morse Co., Montreal.
Graton & Knight Mfg. Co., Montreal.
Jones & Glassco, Montreal.

Linoleum Mill Machinery.
Bertrams, Ltd., Edinburgh, Scotland.

Liquid Air.
L'Air Liquide Society, Montreal, Toronto.
Lever Bros., Toronto.

Lockers, Steel Wardrobe and Steel Material.
Canada Wire & Iron Goods Co., Hamilton, Ont.
Dennis Wire & Iron Works Co., Ltd., London, Canada.

Lockers.
Canada Wire & Iron Goods Co., Hamilton, Ont.
Dennis Wire & Iron Works Co., Ltd., London, Canada.

Locomotive Equipment.
Can. Locomotive Co., Kingston, Ont.

Locomotives, Railroading, Contracting.
Can. Locomotive Co., Kingston, Ont.
National Machinery & Supply Co., Hamilton.

Lubricants.
S. F. Bowser & Co., Fort Wayne, Ind.
Can. Economic Lubricant Co., Montreal.
Can. Oil Company, Toronto.
Crearac Refining Co., Toronto.
Can. Economic Lubricant Co., Montreal.

Machine Tools.
Amalgamated Machy. Corporation, Chicago, Ill.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Montreal.
Can. Machinery Corp., Galt, Ont.
Garlock Machinery, Toronto.
General Supply Co. of Canada, Ltd., Ottawa.
Modern Tool Co., Erie, Pa.
Niles Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.
J. H. Williams Co., Brooklyn, N.Y.

Machinery Dealers.
Can. Fairbanks-Morse Co., Montreal.
Garlock Machinery, Toronto.
Hill, Clarke & Co., of Chicago.
Marshall & Huschart Machinery Co., Chicago.
National Machinery & Supply Co., Hamilton.
New York Machinery Exchange, New York
H. W. Petrie, Toronto.
A. R. Williams Machy. Co., Toronto

Machinery Guards.
Jones & Glassco, Montreal P.Q.
Canada Wire & Iron Goods Co., Hamilton, Ont.
A. R. Williams Machy. Co., Toronto.

Machinery Repairs.
Cunningham & Sons, St. Catharines, Ont.
Plessisville Foundry, Plessisville, Que.

Machinists' Scales, Small Tools and Supplies
Can. Fairbanks-Morse Co., Montreal.
Frank H. Scott, Montreal.
J. H. Williams & Co., Brooklyn, N.Y.

Magnetos.
Lintz-Porter Co., Toronto.

Mandrels
Can. Fairbanks-Morse Co., Montreal
Cleveland Twist Drill Co. Cleveland.
A. R. Iardine & Co. Hespeler, Ont.
Morse Twist Drill and Machine Co., New Bedford
H. W. Petrie, Toronto.
Pratt & Whitney Co. Dundas, Ont.
Will Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Marine Engines
Cunningham & Sons, St. Catharines Ont

Marking Machinery
Brown Boggs Co. Hamilton, Ont.
Noble & Westbrook Mfg. Co., Hartford, Conn.

Marquises
Dennis Wire & Iron Works, London, Ont.

Measuring Tapes and Rules.
James Chesterman & Co., Ltd., Sheffield, Eng.

Metallurgists.
Can. Inspection & Testing Laboratories, Ltd., Montreal.
Toronto Testing Laboratory, Ltd., Toronto.

Metals.
L. C. Tarshis & Sons, Montreal.

Metal Cutting Machines.
Hurlbut, Rogers Machinery Co., South Sudbury, Mass.
Racine Tool & Machine Co., Racine.

Metal Stamping.
Duncan Electrical Co., Montreal.

Meters, Electrical.
Can. H. W. Johns Manville Co., Ltd., Toronto.
Lintz-Porter Co., Toronto.

Mill Machinery.
Cunningham & Sons, St Catharines,
Alexander Fleck, Ltd., Ottawa.

Milling Attachments.
John Bertram & Sons Co., Dundas.
Brown & Sharpe Mfg. Co., Providence.
Cincinnati Milling Machine Co., Cincinnati.
Hendey Mach Co., Torrington, Conn.
Kempsmith Mfg. Co. Milwaukee, W.
Mesta Machine Co., Pittsburg, Pa.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Rockford Milling Machine Co., Rockford, Ill.

Milling Machines, Horizontal and Vertical.
A. R. Williams Machy. Co., Toronto.
Brown & Sharpe Mfg. Co., Providence.
Hill, Clarke & Co. of Chicago, Chicago, Ill.
John Bertram & Sons Co., Dundas.
Foss & Hill Machy. Co., Montreal.
Girard Machine & Tool Co., Philadelphia, Pa
Gooley & Edlund, Cortland, N.Y.
Kempsmith Mfg. Co., Milwaukee, W.
Motch & Merryweather Machy. Co., Cleveland, O.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.
Rockford Milling Machine Co., Rockford, Ill.

Milling Machines, Plain, Bench and Universal.
Brown & Sharpe Mfg. Co., Providence,
Cincinnati Milling Machine Co., Cincinnati.
Foss & Hill Machy. Co., Montreal.
Garvin Machine Co., New York.
Gooley & Edlund, Cortland, N.Y.
Hill, Clarke & Co., of Chicago, Chicago, Ill.
Hendey Machine Co., Torrington.
Kempsmith Mfg. Co., Milwaukee, Wis.
Mesta Machine Co., Pittsburg, Pa.
Motch & Merryweather Machy. Co., Cleveland, O.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.
Rockford Milling Machine Co., Rockford, Ill.
A. R. Williams Machy. Co., Toronto.

Milling Machines, Profile.
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Foss & Hill Machy. Co., Montreal.
Garvin Machine Co., New York.
Girard Machine & Tool Co., Philadelphia Pa.
Mesta Machine Co., Pittsburg, Pa.
Motch & Merryweather Machy. Co., Cleveland, O.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.

Milling Tools.
Brown & Sharpe Mfg. Co., Providence.
Geometric Tool Co., New Haven, Conn.
Kempsmith Mfg. Co. Milwaukee W.
Tabor Mfg. Co., Philadelphia, Pa.

Mine Cars and Hitchings.
Can. Fairbanks-Morse Co. Montreal.
MacKinnon Holmes Co. Sherbrooke,
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.

Mining Machinery
A. R. Williams Machy. Co., Toronto.
Can. Fairbanks-Morse Co. Montreal.
Cleveland Pneumatic Tool Co., of Canada Toronto.
H. W. Petrie Toronto.
Toronto & Hamilton Electric Co., Hamilton Ont.

Mixers, Hot Metal.
Mesta Machine Co., Pittsburg, Pa.

Mortising Machines
Jones & Glassco Montreal.

Motors, Electric
A. R. Williams Machy. Co. Toronto.
Can. Fairbanks Morse Co. Montreal.
Lancashire Dynamo & Motor Co., Ltd. Toronto
Lintz-Porter Co. Toronto
Toronto & Hamilton Electric Co., Hamilton Ont.

Motors, Pneumatic
Cleveland Pneumatic Tool Co. of Canada Toronto.
Independent Pneumatic Tool Co., Chicago.

Mufflers.
Dominion Forge & Stamping Co., Walkerville, Ont.

Multiple Index Centres
Garvin Machine Co. New York.

Nipple Threading Machines
John H. Hall & Sons Ltd. Brantford Ont
Landis Machine Co., Waynesboro Pa.

Nitrogen.
L'Air Liquide Society Montreal Toronto.
Lever Bros. Toronto.

Nozzles, Spray
Can. Buffalo Forge Co., Montreal.

Nuts, Semi-Finish and Finished.
Galt Machine Screw Co., Galt, Ont.
Steel Co. of Canada, Hamilton, Ont.

Nut Burring Machines
National Machy. Co., Tiffin, O.
National Mach. & Sup. Co., Hamilton

Nut Machines (Hot).
National Machy. Co., Tiffin, O.

Nut Facing and Bolt Shaving Machines.
Garvin Machine Co., New York.
National Machy. Co., Tiffin, O.
National Mach. & Sup. Co., Hamilton

Nut Tappers.
John Bertram & Sons Co., Dundas.
Garvin Machine Co., New York.
Greenfield Tap & Die Corporation, Greenfield, Mass.
Hall, J. H., & Son, Brantford, Ont.
A. B. Jardine & Co., Hespeler.
Landis Machine Co., Waynesboro, Pa.
National Machy. Co., Tiffin, O.
National Mach. & Sup. Co., Hamilton

Nut Wrenches.
Wells Brothers Co., Greenfield, Mass.

Oil Separators.
Can. Fairbanks-Morse Co., Montreal.
Sheldons, Ltd., Galt, Ont.
Smart-Turner Machine Co., Hamilton.

Oil Stones.
Carborundum Co., Niagara Falls, N.Y.
Norton Co., Worcester Mass.

Ovens for Baking, Bluing, Drying, Enamelling, Japanning, and Lacquering.
Geo. Gorton Machine Co., Racine, Wis.
Oven Equipment & Mfg. Co., New Haven, Conn.
Whiting Foundry Equipment Co. Harvey, Ill.

Oven Trucks, Steel.
Oven Equipment & Mfg. Co., New Haven, Conn.

Ovens for Drying, Temper and Under Trucks.
Oven Equipment & Mfg. Co., New Haven, Conn.

Overhead Systems.
W. D. Heath & Son, Toronto.

Oscillating Valve Grinders (Pneumatic).
Cleveland Pneumatic Tool Co. of Canada, Toronto.

Oxy-Acetylene Welding and Cutting Plants.
L'Air Liquide Society, Montreal, Toronto.
Lever Bros., Toronto.

Oxygen.
L'Air Liquide Society, Montreal, Toronto.
Lever Bros., Toronto.

Packings, Leather, Hydraulics, Etc.
General Supply Co. of Canada, Ltd., Ottawa.
Graton & Knight Mfg. Co., Montreal.
William R. Perrin, Ltd., Toronto.
H. W. Petrie, Toronto.
Southwark Foundry & Machine Co., Philadelphia.

Packing, Rubber, etc.
Can. H. W. Johns-Manville Co., Ltd., Toronto.

Pans, Lathe.
Cleveland Wire Spring Co., Cleveland

Pans, Steel Shop
Cleveland Wire Spring Co., Cleveland

Paper Mill Machinery.
Bertrams, Ltd., Edinburgh, Scotland.
Can. Sirocco Co., Ltd., Windsor, Ont.

Partitions.
Canada Wire & Iron Goods Co., Hamilton, Ont.
Dennis Wire & Iron Works Co., Ltd., London, Canada.

Patent Solicitors.
H. J. S. Dennison, Toronto.
Fetherstonhaugh & Co., Ottawa.
Marion & Marion, Montreal.
Ridout & Maybee, Toronto.
Ross Thomson & Co., Ottawa, Ont.
Harold Shipman & Co., Ottawa.

Patterns
Galt Malleable Iron Co., Galt.
Guelph Pattern Works, Guelph.
Hamilton Pattern & Foundry Co., Hamilton, Ont.
Owen Sound Iron Works Co., Owen Sound, Ont.
Plessisville Foundry Plessisville, Que.
Toronto Pattern Works, Toronto.
Wells Pattern & Machine Works, Toronto.

Patterns, Metal and Wood
Guelph Pattern Works, Guelph, Ont.

Pattern Shop Equipment.
Oliver Machy. Co., Grand Rapids, Mich.

Perforated Metals and Ornamental Iron Goods.
Canada Wire & Iron Goods Co., Hamilton.

Phosphor Bronze Castings.
Tallman Brass & Metal Co., Hamilton.

Pickling Machines
Mesta Machine Co., Pittsburgh.

Pig Iron
Hanna & Co., M. A., Cleveland, O.
Steel Co. of Canada, Hamilton, Ont.
Stevens, F. B., Detroit, Mich.

Pinions, Mill Cut.
Mesta Machine Co., Pittsburg, Pa.
Wm. Tod Co., Youngstown, O.

BEATH HOISTING AND CONVEYING MACHINERY

Overhead Runways and Trolleys,
Cranes, Derricks,
Chain Blocks,
Electric Hoists and Trolleys,
Rope Blocks,
Friction Hoists,
Hydraulic and Hand Power Ash Hoists,
Coal Handling Machines,
Gravity Roller and Spiral Conveyors.

We Are Installing

BEATH OVERHEAD TRACKS, TROLLEYS AND HOISTS

For Hoisting and Conveying

5-in., 6-in., 8-in. and 9.2-in. Shells

in the receiving, forging, machinery and shipping departments. Beath Overhead Runways require no floor space and are particularly adapted for this service.

The weight of these Shells have caused a new problem in handling that will have to be met and overcome by manufacturers of these heavier types of explosives

Let our engineering department show you how a Beath Overhead Runway can be made to fit into your requirements.

W. D. Beath & Son, Limited

ENGINEERS AND MANUFACTURERS

20 Cooper Avenue - TORONTO

EASTERN REPRESENTATIVES:
The A. M. Ellicott Co., 301 St. James St., Montreal

SPRINGS, WIRE & STEEL — THE WALLACE BARNES CO. ESTABLISHED — "BARNES-MADE" PRODUCTS — 1857 — BRISTOL, CONN. U.S.A. — SCREW MACHINE PRODUCTS

SPECIAL SPRINGS

AND

Screw Machine Products

MADE ON CONTRACT

to the most exacting specifications, and deliveries made as desired.

Ask for Booklet 6-T.

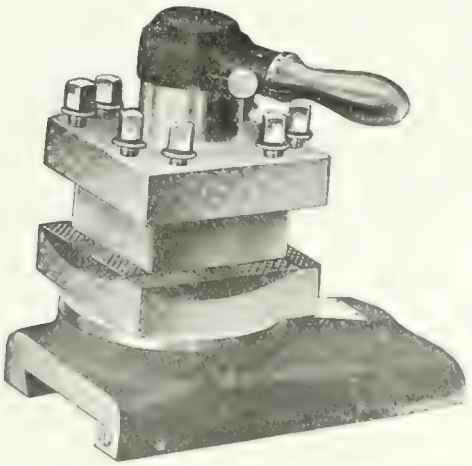
Established 1857
THE WALLACE BARNES COMPANY
218 SOUTH STREET, BRISTOL, CONN., U.S.A.
Manufrs of "Barnes-made" Products
Springs Screw Machine Products Cold Rolled Steel and Wire

Making SHRAPNEL ?

Here is Standard Equipment

The Fay & Scott turret tool post shown here is being universally adopted as standard equipment for the manufacture of shrapnel.

The square head turret, style G, is used for turning the outside of the shell. We have made these turrets for years, and can fit them to any make or size of lathe, old or new.



Style G

Catalog and full details on request

Fay & Scott, Dexter, Me.

Pipe Cutting and Threading Machines.
A. R Williams Machy. Co., Toronto.
Armstrong Mfg. Co., Bridgeport, Conn.
Bignall & Keeler Mfg. Co., Edwardsville, Ill.
Butterfield & Co., Rock Island ,Que.
Can. Fairbanks-Morse Co., Montreal.
Foss & Hill Machy. Co., Montreal.
Garvin Machine Co., New York.
Girard Machine & Tool Co., Philadelphia, Pa.
John H. Hall & Sons, Brantford.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
R. McDougall Co., Galt.
H. W. Petrie, Toronto.
Trimont Mfg. Co., Roxbury, Mass.
Williams Tool Co., Erie, Pa.

Pipe Cutters, Rolling.
Armstrong Mfg. Co., Bridgeport, Conn.
Bignall & Keeler Mfg. Co., Edwardsville, Ill.
John H. Hall & Sons, Ltd., Brantford, Ont.

Pipe Fittings.
Southwark Foundry & Machine Co. Philadelphia.

Pipe, Riveted Steel.
Toronto Iron Works, Ltd., Toronto.

Pipe Straightening Machines.
Watson-Stillman Co., Aldene, N.J.

Planer Drives, Electrical.
Lancashire Dynamo & Motor Co., Ltd., Toronto.
Niles-Bement-Pond Co., New York.

Planer Jacks.
Armstrong Bros. Tool Co., Chicago.

Planers, Standard and Rotary.
John Bertram & Sons Co., Dundas.
Can. Fairbanks-Morse Co., Montreal.
Foss & Hill Machy. Co., Montreal.
Gardner, Robt., & Son, Montreal.
Garvin Machine Co., New York.
Girard Machine & Tool Co., Philadelphia, Pa.
Morton Mfg. Co., Muskegon Heights, Mich.
Niles-Bement-Pond Co., New York.
Oliver Machy. Co., Grand Rapids, Mich.
H. W. Petrie, Toronto.

Planing and Shaping Machinery.
A. R. Williams Machy. Co., Toronto.
Can. Fairbanks-Morse Co, Montreal.
Fay & Scott, Dexter, Maine.
Foss & Hill Machy. Co., Montreal.
Garvin Machine Co., New York.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.

Planing Mill Exhausters.
Can. Buffalo Forge Co., Montreal.
Sheldons, Ltd., Galt, Ont.

Pliers.
Canadian Billings & Spencer, Ltd., Welland.

Pneumatic Tools.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Independent Pneumatic Tool Co., Chicago, New York.

Polishing Machines, Electric and Band.
Can. H. W. Johns-Manville Co., Toronto.

Portable Vise Stands.
New Britain Machine Co., New Britain, Conn.

Portable Steel Tool Racks.
New Britain Machine Co., New Britain, Conn.

Portable Steel Work Stands.
New Britain Machine Co., New Britain, Conn.

Power Plant Equipments.
Can. Fairbanks-Morse Co., Montreal.

Power Transmission.
Mesta Machine Co., Pittsburg, Pa.
The Smart-Turner Mach. Co., Hamilton.

Press Screw (Adjustable).
W. F. & John Barnes Co. Rockford.
Wm. R. Perrin, Ltd., Toronto.

Presses, Bench Straightening.
Toledo Machine & Tool Co., Toledo.

Presses for Shells.
Can. Boomer & Boschert Press Co., Montreal
Can. Locomotive Co., Kingston, Ont.
Wm. Cramp & Sons Ship & Engine Building Co. Philadelphia, Pa.
Charles F. Elmes Eng. Works, Chicago
Foss & Hill Machy. Co., Montreal.
Goldie & McCulloch Co., Galt, Ont.
Mesta Machine Co., Pittsburgh.
William R. Perrin Ltd., Toronto.
H. W. Petrie, Toronto.
Southwark Foundry & Machine Co., Philadelphia, Pa.
Wm. Tod Co., Youngstown, O.
Watson Stillman Co., Aldene, N.J.
West Tire Setter Co., Rochester, N.Y.
Wood, R. D., & Co., Philadelphia.

Presses, Cam, Toggle, Eyelet.
Baird Machine Co., Bridgeport, Conn.
Toledo Machine & Tool Co., Toledo, O.

Presses, Broaching.
E. W. Bliss Co., Brooklyn, N.Y.
Toledo Machine & Tool Co. Toledo.
Watson-Stillman & Co., Aldene, N.J.

Presses, Drop.
W. H. Banfield & Son, Toronto.
E. W. Bliss Co. Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Can. Boomer & Boschert Press Co., Montreal.
Niles Bement-Pond Co., New York.
William R Perrin, Ltd., Toronto.
Toledo Machine & Tool Co., Toledo.
Watson-Stillman Co., Aldene, N.J.

Presses, Filter.
Lymburner Ltd., Montreal.
Wm. R. Perrin, Ltd., Toronto.

Presses, Forging.
Can. Boomer & Boschert Press Co., Montreal.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Wm. Cramp & Sons Ship & Engine Building Co., Philadelphia, Pa.
Charles F. Elmes Eng. Works, Chicago, Ill.
Can. Fairbanks-Morse Co., Montreal.
Girard Machine & Tool Co., Philadelphia Pa.
Mesta Machine Co., Pittsburg, Pa.
Niles-Bement-Pond Co., New York.
Wm. R. Perrin, Ltd., Toronto.
H. W. Petrie, Toronto.
Southwark Foundry & Machine Co., Philadelphia, Pa.
Wm. Tod Co., Youngstown, O.
Toledo Machine & Tool Co., Toledo.
Watson-Stillman Co., Aldene, N.J.

Presses, Hydraulic.
Can. Boomer & Boschert Press Co., Montreal.
Wm. Cramp & Sons Ship & Engine Building Co., Philadelphia, Pa.
A. R. Williams Machy. Co., Toronto.
John Bertram & Sons Co., Dundas.
Charles F. Elmes Eng. Works, Chicago, Ill.
Mesta Machine Co., Pittsburg, Pa.
Niles-Bement-Pond Co., New York.
William R Perrin, Ltd., Toronto.
Southwark Foundry & Machine Co., Philadelphia, Pa
Wm Tod Company, Youngstown, O.
H. W. Petrie, Toronto.
Toledo Machine & Tool Co., Toledo.
Watson-Stillman Co., Aldene N.J.
Wood, R. D., & Co., Philadelphia.

Presses, Pneumatic.
Toledo Machine & Tool Co., Toledo.

Presses, Power.
Baird Machine Co., Bridgeport, Conn.
Can. Boomer & Boschert Press Co., Montreal.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Can.
Can. Fairbanks-Morse Co., Montreal.
Charles F. Elmes Eng. Works, Chicago, Ill.
Geo. Gorton Machine Co., Racine.
Girard Machine & Tool Co., Philadelphia, Pa.
William R Perrin, Ltd., Toronto.
H. W. Petrie, Toronto.
Southwark Foundry & Machine Co., Philadelphia, Pa.
Toledo Machine & Tool Co., Toledo.
Watson-Stillman Co., Aldene, N.J.
A. R. Williams Machy. Co., Toronto.

Presses, Scrap Baling.
Can. Boomer & Boschert Press Co., Montreal
William R Perrin, Ltd., Toronto.
Watson-Stillman Co., Aldene, N.J.

Presses, Spring Foot.
Baird Machine Co., Bridgeport, Conn.
Toledo Machine & Tool Co., Toledo.
Brown, Boggs & Co., Hamilton, Can.

Presses, Screw.
Can. Boomer & Boschert Press Co., Montreal.
Wm. R. Perrin, Ltd., Toronto.

Pressure Regulators.
Can. Fairbanks-Morse Co., Montreal.

Protective Paint.
Jos. Dixon Crucible Co., Jersey City.

Pulleys.
American Pulley Co., Philadelphia.
Baird Machine Co. Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Montreal.
General Supply Co. of Canada, Ltd., Ottawa.
Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.
D. K. McLaren Ltd., Montreal.
H. W. Petrie, Toronto.
Positive Clutch & Pulley Works, Ltd. Toronto.
The Smart-Turner Mach. Co., Hamilton.
A. R. Williams Machy. Co., Toronto.

Pulley Machinery, Drilling and Tapping.
Can. Fairbanks-Morse Co., Montreal.
Niles-Bement-Pond Co., New York.

Pumps, Air.
Mesta Machine Co., Pittsburg, Pa.
Smart Turner Mach. Co., Hamilton.

Pumps, High Pressure.
Charles F. Elmes Eng. Works, Chicago
William R Perrin, Ltd., Toronto.
Smart-Turner Mach. Co Hamilton
Southwark Foundry & Machine Co., Philadelphia.
Watson-Stillman Co., Aldene, N.J.

Pumping Machinery.
A. R Williams Machy. Co., Toronto.
Can. Buffalo Forge Co., Montreal.
Can. Fairbanks-Morse Co., Montreal.
Darling Brothers, Montreal.
D'Olier Centrifugal Pump & Mach. Co., Philadelphia, Pa.
National Mach. & Sup. Co., Hamilton.
Wm. R. Perrin Co., Toronto.
H. W. Petrie, Toronto.
The Smart-Turner Mach. Co., Hamilton.
Southwark Foundry & Machine Co., Philadelphia.
Wm. Tod Company, Youngstown, O.

Pumps, all Kinds.
Can. Buffalo Forge Co., Montreal.
Charles F. Elmes Eng. Works, Chicago
Darling Brothers, Montreal.
General Supply Co. of Canada, Ltd., Ottawa.
Owen Sound Iron Works Co., Owen Sound.
William R. Perrin, Ltd., Toronto.
H. W. Petrie, Toronto.
The Smart-Turner Mach. Co., Hamilton.
A. R. Williams Machy. Co., Toronto.
Watson-Stillman Co., Aldene, N.J.

Pumps, Electrically Driven.
D'Olier Centrifugal Pump & Mach. Co., Philadelphia, Pa.
The Smart-Turner Mach. Co., Hamilton.

Pumps, Hydraulic.
Can. Boomer & Boschert Press Co., Montreal.
Charles F. Elmes Eng. Works, Chicago, Ill.
Darling Brothers, Montreal.
Smart-Turner Mach. Co., Hamilton.
Southwark Foundry & Machine Co., Philadelphia.
Wm. R. Perrin, Ltd., Toronto.
Wm. Tod Co., Youngstown, O.
Watson-Stillman Co., Aldene, N.J.

Pumps for Oiling Systems.
S. F. Bowser & Co., Fort Wayne, Ind.

Pumps, Steam.
Darling Brothers, Montreal.
Smart-Turner Mach. Co., Hamilton.
Wm. Tod Company, Youngstown, O.

Pump Leathers.
Graton & Knight Mfg. Co., Montreal.
Southwark Foundry & Machine Co., Philadelphia.

Punches and Dies.
W. H. Banfield & Sons, Toronto.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Can. Buffalo Forge Co., Montreal.
Can. Fairbanks-Morse Co., Montreal.
Scott Bros., Halifax, Eng.
Gardner, Robt., & Son, Montreal.
Globe Machine & Stamping Co.
A. B. Jardine & Co., Hespeler, Ont.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.
Toledo Machine & Tool Co., Toledo O.

Punches, Power.
John Bertram & Sons Co., Dundas.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton Canada.
Girard Machine & Tool Co., Philadelphia, Pa.
Niles-Bement-Pond Co., New York.
Watson-Stillman Co., Aldene, N.J.

Punches, Pneumatic.
Jno. F. Allen Co., New York.

Punching Machines, Horizontal.
Bertrams, Ltd., Edinburgh, Scotland.
John Bertram & Sons Co., Dundas.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Long & Alstatter Co., Hamilton, Ohio.
Niles-Bement-Pond Co., New York.
Williams, White & Co., Moline, Ill.

Pyrometers.
Canadian Hoskins, Limited, Walkerville, Ont.
Shore Instrument & Mfg. Co., New York City.
Thwing Instrument Co., Philadelphia, Pa.

Quartering Machines.
John Bertram & Sons Co., Dundas.
Niles-Bement-Pond Co., New York.

Ratchet Wrenches.
Wells Brothers Co., Greenfield, Mass.

Railing, Iron and Brass.
Canada Wire & Iron Goods Co., Hamilton, Ont.
Dennis Wire & Iron Works Co., Ltd., London, Canada

Rail Benders.
Niles-Bement-Pond Co., New York.

Railroad Tools.
Can. Fairbanks-Morse Co., Montreal.
Niles-Bement-Pond Co., New York.

Railroad Tools, Hydraulic.
Watson-Stillman Co., Aldene, N.J.

Rapping Plates.
Stevens, F. B., Detroit, Mich.

Ratchets.
Keystone Mfg. Co., Buffalo, N.Y.

Raw Hide Pinions.
Gardner, Robt., & Son, Montreal.
Hamilton Gear & Machine Co., Toronto.
Jones & Glassco, Montreal.
Smart-Turner Machine Co., Hamilton, Ont.

Reamers, Adjustable.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland
Morse Twist Drill & Machine Co., New Bedford.
Pratt & Whitney Co., Dundas, Ont.
Wells Brothers Co., Greenfield, Mass.

Reamers, Bridge, Expanding and High Speed.
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
McKenna Bros. Brass Co., Pittsburgh, Pa.
Morse Twist Drill & Machine Co., New Bedford.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.

Reamer Fluting Machines.
Garvin Machine Co., New York.

Reamers, Pipe, Cylinder and Locomotive.
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Machine Co., New Bedford.
Pratt & Whitney Co., Dundas, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Reaming Machines, Pneumatic.
Cleveland Pneumatic Tool Co., of Canada, Toronto.
Independent Pneumatic Tool Co., Chicago.

Reamers, Steel Taper and Self-Feeding.
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill & Machine Co., New Bedford.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.
Wilt Twist Drill Co., of Canada, Ltd., Walkerville, Ont.

Rebuilt Machine Tools.
New York Machy. Co., New York.

Reels.
Baird Machine Co., Bridgeport, Conn.

Rheostats.
Toronto & Hamilton Electric Co., Hamilton, Ont.

Rivet Machines.
Buffalo Forge Co., Buffalo, N.Y.
National Machinery Co., Tiffin, O.

Rivets, Tubular, Bifurcated.
Parmenter & Bulloch Co., Gananoque.

Rivets, Iron, Copper and Brass.
Parmenter & Bulloch Co., Gananoque.

Riveters, Pneumatic, Hydraulic.

Hammer, Compression.
Alliance Machine Co., Alliance, O.
Jno. F. Allen Co., New York.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Independent Pneumatic Tool Co. of Chicago, Ill.
Mesta Machine Co., Pittsburg, Pa.
National Mach. & Sup. Co., Hamilton.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Southwark Foundry & Machine Co., Philadelphia.
Watson-Stillman Co., Aldene, N.J.

Riveting Machines, Elastic Rotary Blow.
Girard Machine & Tool Co., Philadelphia, Pa.
Grant Mfg. & Machine Co., Bridgeport, Conn.
High-Speed Hammer Co., Rochester, N.Y.
F. B. Shuster Co., New Haven, Conn
Southwark Foundry & Machine Co., Philadelphia.

Rolls, Bending.
John Bertram & Sons Co., Dundas, Ont
Brown, Boggs Co., Ltd., Hamilton, Canada.
Niles-Bement-Pond Co., New York.
Toledo Machine & Tool Co., Toledo.

Rolling Mill Machinery.
Alliance Machine Co., Alliance, O.
Mesta Machine Co., Pittsburg, Pa.
Wm. Tod Co., Youngstown O.

Roofing.
Can. H. W. Johns-Manville Co., Ltd., Toronto.

Rotary Converters.
A. R. Williams Machy. Co., Toronto
Toronto and Hamilton Electric Co., Hamilton.

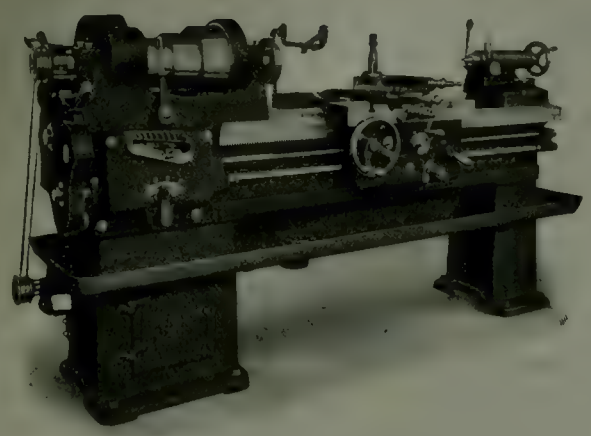
Rubbers.
L. S. Tarshis & Sons, Montreal.

Rubber Mill Machinery.
Bertrams, Ltd., Edinburgh, Scotland
Can. H. W. Johns-Manville Co., Ltd., Toronto.

Rules.
Brown & Sharpe Mfg. Co., Providence, R.I.
James Chesterman & Co., Ltd., Sheffield, Eng.
L. S. Starrett Co., Athol, Mass.

Safety Set Screws.
Allen Mfg. Co., Inc., Hartford, Conn

Sand Blasts.
Curtis Pneumatic Machinery Co., St. Louis, Mo.



THE "OLIVER" 16-INCH
HEAVY DUTY

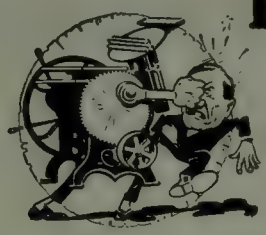
ENGINE LATHE

POWERFUL
DOUBLE BACK GEARED
QUICK-CHANGE GEAR BOX
THREAD CUTTING

EARLY DELIVERIES

Write for Engine Lathe Bulletin No. 47
Write for Turret Lathe Bulletin No. 47T

Oliver Machinery Co.
Grand Rapids, Michigan, U.S.A.



Do You KNOW Him?

Then you should, for this keen and cheery fellow is worth knowing.

He's a likable package of wisdom and smiles—but he's not a preacher.

Once a month he visits all of his friends — the weather doesn't affect him.

Why not get acquainted with him? Costs you nothing.

Tell us you saw this in Canadian Machinery and we'll send him to you every month—free and without obligating you.

THE GLOBE MACHINE & STAMPING COMPANY
Cleveland, Ohio.

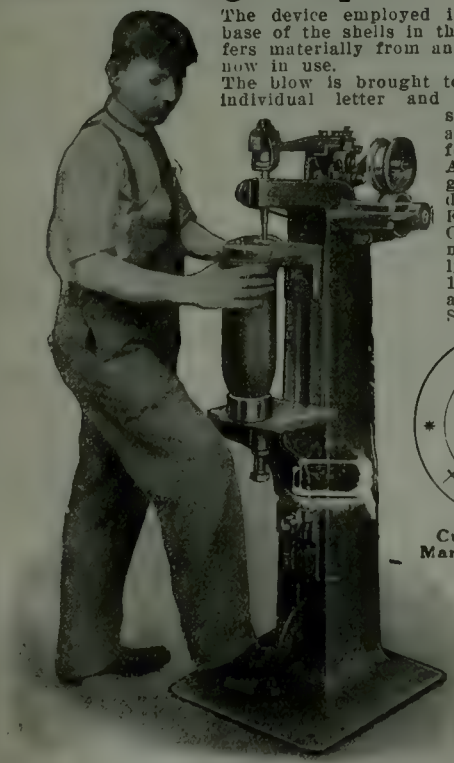
Marking High Explosive Shells

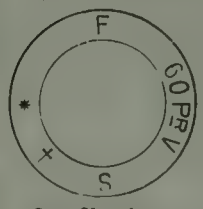
The device employed in marking the base of the shells in this machine differs materially from any other method now in use.

The blow is brought to bear on each individual letter and figure successively and with absolute uniformity.

Adjustable to give shallow or deep impression.

FIFTEEN SECONDS' TIME for marking perfectly one Shell. For 18-pound, 4.5" and 60-pound Shells





Cut Showing Marking on Shell

Full Particulars on Request

The Grant Mfg. & Machine Company
Bridgeport, Conn.

Motor Driven Speed Lathe

This style of motor drive employs a constant speed motor mounted on a plate having an extension arm to support a bearing for the outer end of the motor shaft. The motor plate is fitted to a slide on a shelf which is securely fastened to the back of the lathe bed. The motor plate is moved by means of a screw which tightens or loosens the belt. A four-step cone pulley on the motor shaft is belted to a four-step cone pulley on the spindle. This gives the same speed variation as when a countershaft is used, and by means of various size cones on the motor a wide range of speeds are obtainable.

The lathe spindle is made from high carbon steel, ground to size, and running in self-oiling bronze bearings. The tailstock has screw and lever feed. The bed is crossed-braced and all clamping levers are above the ways.

J. G. BLOUNT CO. - Everett, Mass., U.S.A.

If what you want is not advertised in this issue consult the Buyers' Directory at the back.

Sand Blast Systems.
Whiting Foundry Equipment Co., Harvey, Ill.

Saw Blades.
Diamond Saw & Stamping Works, Buffalo, N.Y.

Sanding Machines.
Oliver Machy. Co., Grand Rapids, Mich.

Saw Tables.
Hub Machine Welding & Contracting Co., Philadelphia, Pa.

Saw Sharpening Machines.
Nutter & Barnes Co, Hinsdale, N.H.

Saw Mill Machinery.
A. R. Williams Machy. Co., Toronto
Can. Fairbanks-Morse Co., Montreal
Espen-Lucas Mach. Works, Philadelphia, Pa.
Gardner, Robt. & Son, Montreal.
Curtis Pneumatic Machinery Co., St. Louis, Mo.
National Mach. & Sup. Co., Hamilton.
H. W. Petrie, Toronto.
Plessisville Foundry, Plessisville, Que.

Saws, High-Speed, Friction.
Espen-Lucas Mach. Works, Philadelphia, Pa.
Hunter Saw & Machine Co., Pittsburg, Pa.
Mesta Machine Co., Pittsburg, Pa.
Nutter & Barnes Co., Hinsdale, N.H.

Saws, Inserted Tooth.
Espen-Lucas Mach. Works, Philadelphia, Pa.
Tabor Mfg. Co., Philadelphia, Pa.

Saws, Hack.
Can. Fairbanks-Morse Co., Montreal
Diamond Saw & Stamping Works, Buffalo
Ford Smith Machine Co., Hamilton.
Garvin Machine Co., New York.
H. W. Petrie, Toronto.
L. S. Starrett Co., Athol, Mass.

Saws, Circular Metal.
H. A. Dunn Co., Montreal.
Espen-Lucas Mach. Works, Philadelphia, Pa.
Hub Machine Welding & Contracting Co., Philadelphia, Pa.
Hunter Saw & Machine Co., Pittsburg, Pa.
Tabor Mfg. Co., Philadelphia, Pa.

Saws, Hot and Cold.
Hunter Saw & Machine Co., Pittsburg, Pa.
Mesta Machine Co., Pittsburgh.
Nutter & Barnes Co., Hinsdale, N.H.

Scleroscopes.
Shore Instrument & Mfg. Co., New York City.

Scrap Iron.
L. S. Tarshis & Sons, Montreal.

Screw Machine Products.
Wallace, Barnes Co., Bristol, Conn.

Screw Machines, Hand, Automatic.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Montreal
Garvin Machine Co., New York.
Girard Machine & Tool Co., Philadelphia, Pa.
Hill Clarke & Co., of Chicago, Chicago, Ill.
A. R. Jardine & Co., Hespeler.
Motch & Merrryweather Machy. Co., Cleveland, O.
National Mach. & Sup. Co., Hamilton.
New Britain Machine Co., New Britain, Conn.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.
Warner & Swasey Co., Cleveland, O.
A. R. Williams Machy. Co., Toronto.
Windsor Machine Co., Windsor, Vt.

Screw Machines, Multiple Spindle.
New Britain Machine Co., New Britain, Conn.
Windsor Machine Co., Windsor, Vt.

Screw Plates.
Butterfield & Co., Rock Island, Que.
Can. Tap & Die Co., Galt, Ont.
A. R. Jardine & Co., Hespeler.
Morse Twist Drill & Machine Co., New Bedford.
Wells Brothers Co., Greenfield, Mass.
Wiley & Russell Co., Greenfield, Mass.

Screw Slotters.
Garvin Machine Co., New York.
Pratt & Whitney Co., Dundas, Ont.

Set Screws, Safety.
Allen Mfg. Co., Hartford, Conn.

Second-Hand Machinery.
New York Machinery Co., New York.
Gardner, Robt. & Son, Montreal.
Can. Drawn Steel Co., Hamilton, Ont.
Gardner, Robt. & Son, Montreal.
National Mach. & Sup. Co., Hamilton.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Plessisville Foundry, Plessisville, Que.
The Smart-Turner Machine Co., Hamilton.
Union Drawn Steel Co., Hamilton.

Shanks, Straight and Taper.
Jacobs Mfg. Co., Hartford, Conn.

Shapers.
John Bertram & Sons Co., Dundas.
Can. Fairbanks-Morse Co., Montreal.
Canada Machy. Corp., Galt, Ont.
Pratt & Whitney Co., Montreal.

Gardner, Robt., & Son, Montreal.
Girard Machine & Tool Co., Philadelphia, Pa.
Hendey Machine Co., Torrington, Ct.
Hill, Clarke & Co., of Chicago, Chicago, Ill.
H. W. Petrie, Toronto.

Shafting.
A. R. Williams Machy. Co., Toronto.
Can. Fairbanks-Morse Co., Montreal.
Mesta Machine Co., Pittsburg, Pa.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.

Sharpening Stones.
Carborundum Co., Niagara Falls, N.Y.
Norton Co., Worcester, Mass.

Shavings, Separators.
Can. Buffalo Forge Co., Montreal.
Sheldons, Ltd., Galt, Ont.

Shearing Machines, Angle Iron, Bar and Gate.
John Bertram & Sons Co., Dundas.
Bertrams, Ltd., Edinburgh, Scotland.
Girard Machine & Tool Co., Philadelphia, Pa.
A. R. Jardine & Co., Hespeler.
Long & Alstatter, Hamilton, Ohio.
Mesta Machine Co., Pittsburg, Pa.
Niles-Bement-Pond Co., New York.
Scott Bros., Halifax, Eng.
Toledo Machine & Tool Co., Toledo.
Williams, White & Co., Moline, Ill.

Shears, Power.
John Bertram & Sons Co., Dundas.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Buffalo Forge Co., Buffalo, N.Y.
Girard Machine & Tool Co., Philadelphia, Pa.
Mesta Machine Co., Pittsburg, Pa.
National Machy. Co., Tiffin, Ohio.
National Mach. & Sup. Co., Hamilton.
Niles-Bement-Pond Co., New York.
Scott, Bros., Halifax, Eng.
H. W. Petrie, Toronto.
Toledo Machine & Tool Co., Toledo.

Shears, Lever, Hydraulic.
Mesta Machine Co., Pittsburg, Pa.
Watson-Stillman Co., Aldene, N.J.

Shears, Pneumatic.
John F. Allen Co., New York.
Toledo Machine & Tool Co., Toledo, Ohio.

Shears, Squaring.
Brown, Boggs & Co., Hamilton, Can.

Sheet Metal Working Tools.
Baird Machine Co., Bridgeport, Conn.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Can.
Steel Bending Brake Works, Ltd., Chatham, Ont.

Sheet Metal Stampings.
Dominion Forge & Stamping Co., Walkerville, Ont.

Shell Banding Machines, Hydraulic.
Wm. Cramp & Sons Ship & Engine Bldg. Co., Philadelphia, Pa.
Can. Locomotive Co., Kingston, Ont.
Goldie & McCulloch Co., Galt, Ont.
Lymburner, Ltd., Montreal.
Motch & Merrryweather Machy. Co., Cleveland, O.
Watson-Stillman Co., Aldene, N.J.
West Tire Setter Co., Rochester, N.Y.

Shell Hoisting Machinery.
Death, W. D., & Son, Toronto.

Shell Lathes.
Barrett Machine Tool Co., Meadville, Pa.
Garlock-Machinery, Toronto.
Jenckes Machine Co., Sherbrooke, Que.
Kellogg & Co., Toronto.
H. W. Petrie, Toronto.

Shell Manufacturing Tools.
Amalgamated Machinery Corporation, Chicago, Ill.
Frank Toomey, Inc., Philadelphia, Pa.
Garlock Machinery, Toronto.
New York Machinery Exchange, New York.
Hill, Clarke & Co. of Chicago.
H. W. Petrie, Toronto.

Shell Painting Machine.
Can. Buffalo Forge Co., Montreal.
Can. Locomotive Co., Kingston, Ont.

Shell Screws, Headless.
Blake & Johnson, Waterbury, Conn.

Shell Riveters.
Grant Mfg. & Machine Co., Bridgeport, Conn.

Shelving, Steel Partitions.
Canadian Steel Products Company, Montreal

Sherardizing.
Chambers, Ltd., Toronto.

Shrapnel Shell Marker.
Brown Boggs Co., Hamilton, Ont.
Holden Morgan Co., Toronto
Noble & Westbrook Mfg. Co., Hartford, Conn.

Shrapnel Sand Blasts.
W. W. Sly Mfg. Co., Cleveland, O.

Side Tools.
Armstrong Bros. Tool Co., Chicago.

Sirens, Electric.
Lintz Porter Co., Toronto
Sheldons, Ltd., Galt, Ont.

Silver Solder.
Geo. H. Lees & Co., Ltd., Hamilton, Ont.

Slotters.
Garvin Machine Co., New York.
Niles-Bement-Pond Co., New York.

Smokestacks.
MacKinnon, Holmes Co., Sherbrooke, Que.
Plessisville Foundry, Plessisville, Que.

Sockets.
Brown & Sharpe Mfg. Co., Providence, R.I.
Cleveland Twist Drill Co., Cleveland.
Keystone Mfg. Co., Buffalo, N.Y.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Bedford.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.
J. H. Williams Co., Brooklyn, N.Y.

Soldering Irons.
Brown, Boggs & Co., Hamilton, Can.

Solders.
Tallman Brass & Metal Co., Hamilton.

Specialties, Electric.
Lintz-Porter Co., Toronto.

Special Machinery.
Armstrong Bros., Toronto.
W. H. Banfield & Sons, Toronto.
John Bertram & Sons Co., Dundas.
Baird Machine Co., Bridgeport, Conn.
Bliss, E. W. Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Can.
Can. Fairbanks-Morse Co., Montreal.
Canada Machy. Agency, Montreal.
Cunningham & Sons, St. Catharines, Ont.
Charles F. Elmes Eng. Works, Chicago
Ford-Smith Machine Co., Hamilton.
Garvin Machine Co., New York.

Gooley & Edlund, Inc., Courtland, N.Y.
Grant Mfg. & Machy. Co., Bridgeport, Conn.
John H. Hall & Sons, Brantford
Jardine, A. R., & Co., Hespeler.
National Electric Welder Co., Warren, Ohio.
National Forge & Tool Co., Erie, Pa.
National Mach. & Sup. Co., Hamilton
Plessisville Foundry, Plessisville, Que.
Smart-Turner Machine Co., Hamilton, Ont.
William R. Perrin, Ltd., Toronto.
Wm. Tod Company, Youngstown, O.

Spike Machines.
The Smart-Turner Machine Co., Hamilton.

Spring Coilers.
Baird Machine Co., Bridgeport, Conn.
Garvin Machine Co., New York.

Springs, Machinery.
Cleveland Wire Spring Co., Cleveland.
Jas. Steele, Ltd., Guelph, Ont.
Wallace, Barnes Co., Bristol, Conn.

Spring Making Machinery (Automatic).
Baird Machine Co., Bridgeport, Conn.

Sprockets, Chain.
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia, Pa.

Stairs, Iron.
Canada Wire & Iron Goods Co., Hamilton, Ont.
Dennis Wire & Iron Works Co., Ltd. London, Canada.

Stampings.
Dominion Forge & Stamping Co., Walkerville, Ont.

Stamping Machinery.
Brown, Boggs & Co., Hamilton, Can.

Stationary Ladders.
New Britain Machine Co., New Britain, Conn.

Steam Specialties.
General Supply Co. of Canada, Ltd., Ottawa.
Sheldons, Ltd., Galt, Ont.

Steam Separators and Traps.
Can. Fairbanks-Morse Co., Montreal.
Can. Sirocco Co., Ltd., Windsor, Ont.
H. W. Petrie, Toronto.
Sheldons, Ltd., Galt, Ont.
The Smart-Turner Machine Co., Hamilton.

Steel Alloy.
Vanadium Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

Steel Chains for Pulp Mill and Saw Mill.
Plessisville Foundry, Plessisville, Que.

Steel Barrels.
Smart-Turner Machine Co., Hamilton, Ont.

Steel Bench Legs.
New Britain Machine Co., New Britain, Conn.

Steel Bending Brakes.
Steel Bending Brake Works, Ltd., Chatham, Ont.

Steel, Cold Rolled.
Can. Drawn Steel Co., Hamilton, Ont.
A. C. Leslie & Co., Ltd., Montreal.
Union Drawn Steel Co., Hamilton, Ont.
Wallace, Barnes Co., Bristol, Conn.

Steel Drums.
Smart-Turner Machine Co., Hamilton, Ont.

Steel Pressure Blowers.
Can. Buffalo Forge Co., Montreal.
Can. Fairbanks-Morse Co., Montreal.

Steel, all kinds.
Lackawanna Steel Co., Lackawanna, N.Y.

Steel, High Speed.
Armstrong Whitworth of Canada, Ltd., Montreal.
Can. Fairbanks-Morse Co., Montreal.
H. A. Drury Co., Ltd., Montreal.
Thos. Firth & Sons, Montreal.
Hawkridge Bros. Co., Boston, Mass.
National Mach. & Sup. Co., Hamilton.
H. W. Petrie, Toronto.
Vanadium Alloys Steel Co., Pittsburg, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

Steel Die Engraving.
Noble & Westbrook Mfg. Co., Hartford, Conn.

Steel Machinery.
Hawkridge Bros. Co., Boston, Mass.

Steel Vanadium.
Vanadium Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

Stock Racks for Bars, Piping, Etc.
New Britain Machine Co., New Britain, Conn.

Stocks for Dies.
Armstrong Manufacturing Co., Bridgeport, Conn.
Wells Bros. Co., Greenfield, Mass.

Stocks, Pipe.
Armstrong Manufacturing Co., Bridgeport, Conn.
Butterfield & Co., Rock Island, Que.
Greenfield Tap & Die Corporation, Greenfield, Mass.

Stools, Steel, Shop.
Dennis Wire & Iron Works Co., Ltd., London, Canada.

Storage Systems.
S. F. Bowser & Co., Fort Wayne, Ind.

Stoves, Electric.
Lintz-Porter Co., Toronto.

Straight Edges.
Steel Bending Brake Works, Ltd., Chatham, Ont.

Straightening Machinery.
Baird Machine Co., Bridgeport, Conn.
Bertrams, Ltd., Edinburgh, Scotland
National Mach. & Sup. Co., Hamilton.

Structural Steel.
Hamilton Bridge Works Co., Hamilton, Ont.
Lackawanna Steel Co., Lackawanna, N.Y.
Owen Sound Iron Works Co., Owen Sound, Ont.

Stud Driver.
Keystone Mfg. Co., Buffalo, N.Y.

Switchboards and Telephones.
Lintz-Porter Co., Toronto.
Toronto & Hamilton Electric Co., Hamilton.

Switches, Railway.
National Mach & Sup. Co., Hamilton.

Tanks, Gasoline.
Dominion Forge & Stamping Co., Walkerville, Ont.

Tanks, Oil, Etc.
S. F. Bowser & Co., Fort Wayne, Ind.
MacKinnon, Holmes Co., Sherbrooke, Que.

Tanks, Steel.
John Inglis Co., Toronto.
MacKinnon, Holmes Co., Sherbrooke, Que.
Plessisville Foundry, Plessisville, Que.
Toronto Iron Works, Ltd., Toronto.

Tanks, Pressure.
Toronto Iron Works, Ltd., Toronto.

Tanks, Water.
MacKinnon, Holmes Co., Sherbrooke, Que.

Tank Wagons.
MacKinnon, Holmes Co., Sherbrooke, Que.
Toronto Iron Works, Ltd., Toronto.

Tapes, Measuring.
James Chesterman & Co., Ltd., Sheffield, Eng.

Tapes, Friction.
Can. H. W. Johns-Manville Co., Ltd., Toronto.

Tapping Machines (Pneumatic).
Cleveland Pneumatic Tool Co. of Canada, Toronto
Independent Pneumatic Tool Co. Chicago, Ill.

Tapping Machines and Attachments.
Baker Brothers, Toledo, O.
John Bertram & Sons Co., Dundas.
Garvin Machine Co., New York.
The Geometric Tool Co., New Haven.
Girard Machine & Tool Co., Philadelphia, Pa.
Greenfield Tap & Die Corporation, Greenfield, Mass.
J. H. Hall & Sons, Brantford, Ont.
A. R. Jardine & Co., Hespeler.
Landis Machine Co., Waynesboro, Pa.
Manufacturers Equipment Co., Chicago, Ill.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Rickart Shaper Co., Erie, Pa.
L. S. Starrett Co., Athol, Mass.

A Sensible Suggestion For You

With Christmas but three weeks away, our thoughts naturally turn to the time-honored custom of giving gifts of remembrance to our friends.

It has been a year of serious thinking, and the thoughts of the nation will be reflected in its Christmas giving. The useful gift will be the most acceptable and the most appreciated.

Let us suggest something that, considering its real value, will prove comparatively inexpensive.

Something that will constantly remind the recipient of your thoughtfulness.

Something that will prove a neat compliment to the one receiving it, that you considered him capable of appreciating a gift of this character.

At the direction of

you have been entered upon our subscriptio.. list to receive

for one year.

It is our hope that each copy you receive may serve as a pleasant reminder of the one who sends you this holiday remembrance.

The MacLean Publishing Co., Limited, Toronto.

Let Us Suggest Canadian Machinery

Give CANADIAN MACHINERY to your employees and to your friends this Christmas.

It is only $2.00 for 52 issues, yet throughout the year its value will be magnified as its usefulness becomes more fully appreciated.

Send us the list of names and addresses, and we will send a handsome three-colored announcement card, a small reproduction of which is shown. This, together with the first copy of CANADIAN MACHINERY, will reach the recipient on Christmas Day. *Try it this year!*

CANADIAN MACHINERY

143 University Avenue, Toronto, Ontario, Canada

Tap Chucks.
Wells Bros., Greenfield, Mass.

Taps, Adjustable.
Geometric Tool Co., New Haven.
Manufacturers Equipment Co., Chicago, Ill.
Murchey Machine & Tool Co., Detroit.

Taps, Dies and Wrenches.
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Can. Tap & Die Co., Galt, Ont.
Cleveland Twist Drill Co., Cleveland.
Geometric Tool Co., New Haven, Conn.
A. B Jardine & Co., Hespeler.
Morse Twist Drill & Machine Co., New Bedford
Murchey Machine & Tool Co., Detroit.
H W Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.
L. S. Starrett Co., Athol, Mass.
Wells Brothers Co., Greenfield, Mass.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Technical Books.
The MacLean Publishing Co., Ltd., Toronto.

Telephone Systems.
Lintz-Porter Co., Toronto.

Testing Instruments, Metallurgical.
Shore Instrument & Mfg. Co., New York City.

Testing Laboratories.
Can Inspection & Testing Laboratories, Ltd., Montreal.
Toronto Testing Laboratory, Toronto.

Thread Cutting Machines.
Can. Fairbanks-Morse Co., Montreal.
Garvin Machine Co., New York.
Geometric Tool Co., New Haven, Conn.
Girard Machine & Tool Co., Philadelphia, Pa
Greenfield Tap & Die Corporation, Greenfield, Mass.
Landis Machine Co., Waynesboro, Pa.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.
National Machy. Co., Tiffin, Ohio.

Time Clocks.
International Time Recording Co Toronto.
Lintz-Porter Co., Toronto.

Tinsmiths' Tools.
Brown, Boggs & Co., Hamilton, Can
Steel Bending Brake Works, Ltd., Chatham, Ont.

Tire Setting Machines, Hydraulic.
William R. Perrin, Ltd., Toronto.
West Tire Setter Co., Rochester, N.Y.

Tire, Wheels.
Wells Bros Co., Greenfield, Mass.

Toolmakers' Files.
American Swiss File & Tool Co., New York.

Tool Boxes, Steel.
Can. Steel Products Co., Montreal.

Tool Holders.
Armstrong Bros. Tool Co., Chicago.
Cleveland Twist Drill Co., Cleveland.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.
J. H. Williams Co., Brooklyn, N.Y.

Tool Room Partitions.
Can. Wire & Iron Goods Co., Hamilton.

Tool Posts, Lathe.
Armstrong Bros. Tool Co., Chicago.

Tool Steel.
Armstrong, Whitworth, Ltd., of Canada, Montreal.
Can. Fairbanks-Morse Co., Montreal.
H. A. Drury Co., Montreal.
Thos. Firth & Sons, Montreal.
Hawkridge Bros. Co., Boston, Mass
A. C Leslie & Co., Ltd., Montreal.
National Mach & Sup. Co., Hamilton.
H. W. Petrie, Toronto.
Vulcan Crucible Steel Co., Aliquippa, Pa.

Tools, Blacksmiths', Etc.
A. R. Williams Machy. Co., Toronto.

Tools, Electrical.
A. R. Williams Machy. Co., Toronto.
Can H. W. Johns-Manville Co., Ltd., Toronto.
United States Elec. Tool Co., Cincinnati, O.

Tools, Lathe, Planer and Slotter
Armstrong Bros. Tool Co., Chicago

Torches, Steel.
Stevens, F. B. Detroit, Mich
Armstrong Whitworth of Canada Ltd., Montreal.

Track Bits.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Track Systems.
Heath, W. D., & Son, Toronto.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

Track Tools.
Can. H. W. Johns-Manville Co., Ltd., Toronto
Can. Fairbanks-Morse Co., Montreal.

Transformers and Converters.
A. R. Williams Machy. Co., Toronto.
Can. Fairbanks-Morse Co., Montreal.
H. W. Petrie, Toronto.
Toronto & Hamilton Electric Co., Hamilton, Ont.

Transmission Machinery.
American Pulley Co., Philadelphia, Pa.
A. R. Williams Machy. Co., Toronto.
Can. Fairbanks-Morse Co., Montreal.
Can. Drawn Steel Co., Hamilton, Ont.
Hamilton Gear & Mach. Co., Toronto.
Jones & Glassco, Montreal.
Main Belting Co., Montreal.
Morse Chain Co., Ithaca, N.Y.
H. W. Petrie, Toronto.
Plessisville Foundry, Plessisville, Que
F. Reddaway & Co., Montreal.
The Smart-Turner Machine Co., Hamilton.

Transmission Towers.
Can. Bridge Co., Walkerville, Ont.
Canadian Ingersoll-Rand Co., Ltd., Montreal.
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Northern Crane Works, Walkerville.
Tallman Brass & Metal Co., Hamilton.

Traveling Cranes.
Northern Crane Works, Walkerville.
Smart-Turner Machine Co., Hamilton, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

Trolley Hoists, Electric.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

Trucks, Lumber and Kiln.
Sheldons, Ltd., Galt, Ont.
Northern Crane Works, Walkerville.

Trucks, Factory, Freight, Etc.
Chambers, Ltd., Toronto.
Chapman Double Ball Bearing Co., Toronto.
General Supply Co. of Canada, Ltd., Ottawa.
Whiting Foundry Equipment Co., Harvey, Ill.

Tube Expanders (Rollers).
A. B. Jardine & Co., Hespeler.
Watson-Stillman Co., Aldene, N.J.

Tumbling Barrels.
Baird Machine Co., Bridgeport, Conn.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill

Turbines, Steam.
Southwark Foundry & Machine Co., Philadelphia, Pa.

Turnbuckles.
Canadian Billings & Spencer, Ltd., Welland.
Can. H. W. Johns-Manville Co., Ltd., Toronto.

Turret Machines.
Brown & Sharpe Mfg. Co., Providence, R.I.
Fay & Scott, Dexter, Me.
Girard Machine & Tool Co., Philadelphia, Pa.
Hill, Clarke & Co. of Chicago, Chicago, Ill.
Mitch & Merryweather Machy. Co., Cleveland, O.
New Britain Machine Co., New Britain, Conn.
H W. Petrie, Toronto.
Pratt & Whitney, Hartford, Conn.
Turner Machine Co., Ltd., Danbury, Conn.
Warner & Swasey, Cleveland, O.

Turbine Water Wheels.
Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.

Turbines, Steam, Water.
Plessisville Foundry, Plessisville, Que.

Upsetting and Bending Machinery.
A R Williams Machy. Co., Toronto.
John Bertram & Sons Co., Dundas.
Brown Boggs Co., Ltd., Hamilton, Canada.
A. B Jardine & Co., Hespeler.
National Machy Co., Tiffin, O.
Niles Bement Pond Co., New York.
H W Petrie, Toronto.
Watson-Stillman Co., Aldene, N.J.

Vacuum Pumps.
Buffalo Forge Co., Buffalo, N.Y.
Mesta Machine Co., Pittsburgh.
Smart-Turner Machine Co., Hamilton, Ont.

Valves, Foot.
Smart-Turner Mach Co., Hamilton.

Valve Grinders (Pneumatic).
Cleveland Pneumatic Tool Co. of Canada, Toronto.

Valves, Hydraulic.
Can. Boomer & Boschert Press Co., Montreal.
Charles F. Elmes Eng. Works, Chicago, Ill.
Mesta Machine Co., Pittsburg, Pa.
Southwark Foundry & Machine Co., Philadelphia.
Watson Stillman Co., Aldene, N.J.
R. D. Wood & Co., Philadelphia, Pa.

Valve Leathers.
Graton & Knight Mfg. Co., Montreal.

Valves, Back Pressure, Steam.
Mesta Machine Co., Pittsburg, Pa.
Sneldons, Limited, Galt.

Vanadium Steel.
H. A Drury Co., Ltd., Montreal.
Hawkridge Bros. Co., Boston, Mass.

Ventilating Apparatus.
Can. Sirocco Co., Ltd., Windsor, Ont.
Sheldons, Limited, Galt.
H. W Petrie, Toronto.
A. R. Williams Machy. Co., Toronto.

Vises, Bench.
Emmert Mfg. Co., Waynesboro, Pa.
Hollands Mfg. Co., Erie, Pa.
National Mach. & Sup. Co., Hamilton.
New Britain Machine Co., New Britain, Conn.
H. W. Petrie, Toronto.

Vises, Pipe.
Armstrong Mfg. Company, Bridgeport, Conn.
Bignall & Keeler Mach. Works, Edwardsville, Ill.
Butterfield & Co., Rock Island, Que.
Emmert Mfg. Co., Waynesboro, Pa.
National Mach. & Sup. Co., Hamilton.
J. H. Williams Co., Brooklyn, N.Y.

Vises, Planer and Shaper.
Girard Machine & Tool Co., Philadelphia, Pa.
National Mach. & Sup. Co., Hamilton.
Skinner Chuck Co., New Britain, C.

Vises, Milling Machine.
National Mach. & Sup. Co., Hamilton.

Vises, Woodworking.
Emmert Mfg. Co., Waynesboro, Pa.

Washers.
Graton & Knight Mfg. Co., Worcester, Mass.
London Bolt & Hinge Works, London. Ont.
Wallace, Barnes Co., Bristol, Conn.

Washer Machines.
National Machy. Co., Tiffin, Ohio.

Waterproof Coating, Cement, Fabric.
Can. H. W. Johns-Manville Co., Ltd., Toronto.

Watchman's Clocks.
Lintz-Porter Co., Toronto.
A. R. Williams Machy. Co., Toronto.

Water Cinder Mills.
Whiting Foundry Equipment Co., Harvey, Ill.

Water Towers.
Toronto Iron Works, Ltd., Toronto.

Water Wheels.
Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.

Welding and Cutting Clamps.
Can. Blaugas Co., Ltd., Montreal.
Detroit Electric Welder Co., Detroit, Mich.
L'Air Liquide Society, Toronto.
Lever Bros., Toronto.
National Electric Welder Co., Cincinnati, O.

Welding and Cutting Work.
Can. Blaugas Co., Ltd., Montreal.
Detroit Electric Welder Co., Detroit, Mich.
L'Air Liquide Society, Toronto.
Lever Bros., Toronto.
Metals Welding Co., Cleveland, O
National Electric Welder Co., Cincinnati, O.

Welding, Autogenous.
Can. Blaugas Co., Ltd., Montreal.
Detroit Electric Welder Co., Detroit, Mich.
L'Air Liquide Society, Toronto.
Lever Bros., Toronto.
National Electric Welder Co., Cincinnati, O.

Welding, Acetylene and Oxygen.
Can. Blaugas Co., Ltd., Montreal.
Detroit Electric Welder Co., Detroit, Mich.
L'Air Liquide Society, Toronto.
Lever Bros., Toronto.
Metals Welding Co., Cleveland, O
National Electric Welder Co., Cincinnati, O.

Welding Machines, Electric, etc
Can. Blaugas Co., Ltd., Montreal.
Detroit Electric Welder Co., Detroit, Mich.
Lever Bros., Toronto.
National Electric Welder Co., Cincinnati, O.
Tabor Mfg. Co., Philadelphia, Pa.

Wheels, Emery, Carborundum.
Can. Hart Wheels, Ltd., Hamilton Ont.
H. W. Petrie, Toronto.

Wheels, Belt, Fly, Gear and Rope.
Mesta Machine Co., Pittsburg, Pa.

Winches.
John H. Hall & Sons, Brantford.
Northern Crane Works, Walkerville.

Window Wire Guards.
Canada Wire & Iron Goods Co., Hamilton.

Wire Cloth and Perforated Metals.
Canada Wire & Iron Goods Co., Hamilton.
Dennis Wire & Iron Works Co., Ltd., London.

Wire Forms.
Wallace, Barnes Co., Bristol, Conn.

Wire Forming and Stamping Machinery.
Brown, Boggs Co., Ltd., Hamilton Canada.
F. B. Shuster Co., New Haven, Conn.
Baird Machine Co., Bridgeport, Conn.

Wire Guards and Railings.
Canada Wire & Iron Goods Co. Hamilton, Ont.

Wire Nails.
Parmenter & Bulloch Co., Gananoque.

Wire Nail Machinery.
National Machy. Co., Tiffin, Ohio.
A. R. Williams Machy. Co., Toronto.

Wire, Spring.
Wallace, Barnes Co., Bristol, Conn.

Wire Straighteners and Cutters.
Baird Machine Co., Bridgeport, Conn.
Brown, Boggs Co., Ltd., Hamilton, Canada.
F. B. Shuster Co., New Haven, Conn.

Wire Coiling and Pointing Machines.
Baird Machine Co., Bridgeport, Conn.
F. B. Shuster Co., New Haven, Conn.

Wood Boring Machines.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Machinery, Toronto.
Girard Machine & Tool Co., Philadelphia, Pa.
H. W. Petrie, Toronto.

Wood Jointers.
Oliver Machy. Co., Grand Rapids, Mich.

Woodworking Machinery.
Buffalo Forge Co., Buffalo, N.Y.
Can. Fairbanks-Morse Co., Montreal.
Garlock-Machinery, Toronto.
Girard Machine & Tool Co., Philadelphia, Pa.
General Supply Co. of Canada, Ltd., Ottawa.
New Britain Machine Co., New Britain, Conn.
Oliver Machy. Co., Grand Rapids, Mich.
H W. Petrie, Toronto.
Plessisville Foundry, Plessisville, Que.
A. R. Williams Machy. Co., Toronto.

Wood Lathes.
Oliver Machy. Co., Grand Rapids, Mich.

Wood Trimmers.
Oliver Machy. Co., Grand Rapids, Mich.

Wool.
L. S. Tarshis & Sons, Montreal

Wrenches, Compression.
Lutz-Webster Engineering Co., Inc Philadelphia, Pa.

Wrenches.
Armstrong Bros. Tool Co., Chicago Ill.
Butterfield & Co., Rock Island, Que.
Canadian Billings & Spencer, Ltd., Welland.
Keystone Mfg. Co., Buffalo, N.Y.
Lutz-Webster Engineering Co., Inc., Philadelphia, Pa.
Wells Bros. Co., Greenfield, Mass.
J. H. Williams Co., Brooklyn, N.Y.

Wrenches, Automobile Narrow Jaw and Monkey.
Bemis & Call Hardware & Tool Co Springfield, Mass.
Trimont Mfg. Co., Roxbury, Mass.

Wrenches, Pipe, Monkey.
Bemis & Call Hardware & Tool Co. Springfield, Mass.
Trimont Mfg. Co., Roxbury, Mass.

Wrenches, Ratchet and Basin.
Bemis & Call Hardware & Tool Co., Springfield, Mass.
Keystone Mfg. Co., Buffalo, N.Y.
Trimont Mfg. Co., Roxbury, Mass.

M·A HANNA & Co.

FROM
PORT COLBORNE

"Victoria"
PIG IRON

Foundry
Soft and Strong
Malleable

Shipments from
The Canadian Furnace Co.

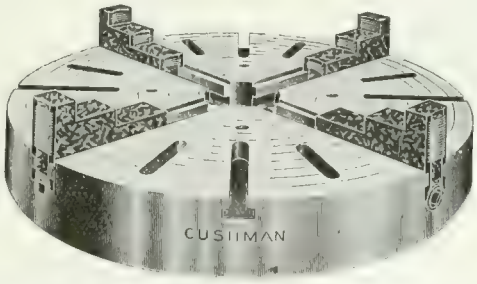
M. A. HANNA & CO.
Sales Agents Cleveland

WOLFRAM
MADE IN THE U.S.A.
HIGH SPEED STEEL
TRADE MARK

Wolfram Cobalt High-Speed Steel, BEST FOR TURNING SHRAPNEL. Vulcan Hot Piercing Steel, FOR ALL KINDS OF HOT WORK. Vulcan Regal No. 2 Steel, FOR BRASS FINISHINGS. Vulcan Special "W" Steel, For Special Taps and Dies Vulcan Non-Shrinkable Steel, For Intricate Dies. Vulcan Special Vanadium Steel Does Twice the Work of Regular Carbon Steels

VULCAN CRUCIBLE STEEL COMPANY
ALIQUIPPA, PA.

Cushman Chucks



When you buy a "Cushman" Chuck you are absolutely sure of getting one having strength, accuracy and durability. Being specialists in these goods we are able to furnish Chucks of quality at a very moderate price.

Our line of styles and sizes is very complete—

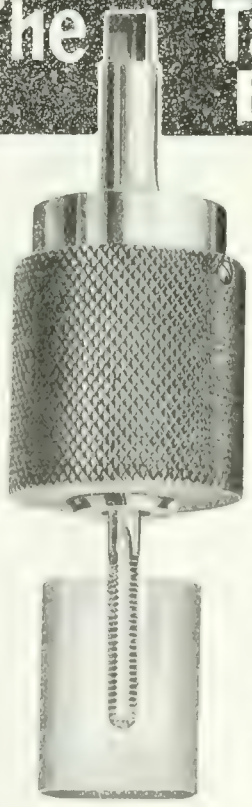
Lathe Chucks, Drill Chucks, Centering Chucks, Portable Face Plate Jaws

Our regular chucks are known as the heavy pattern, but we now have a new line called "Blue Line" Chucks, made entirely of steel.

Let us send you our catalog.

The Cushman Chuck Co.
Hartford, Conn., U.S.A.

The Tap Can't Break



Tapping to the bottom of the hole

The Woodstock Tapping Chuck

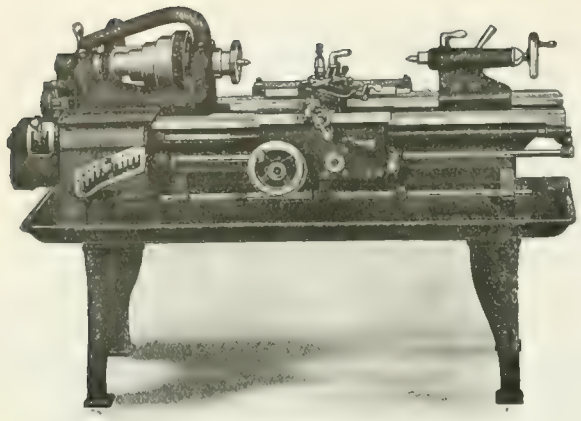
enables you to drive taps to the bottoms of blind holes in toughest of metals with no tap breakage; enables you to use 95% of the strength of the tap while at the same time cutting 50% off tapping cost.

It eliminates tap breakage because the chuck automatically releases the instant the tap bends or reaches the bottom of the hole.

Every shop profits by their use.

Drop a line for full description

Peter Bros. Mfg. Co.
ALGONQUIN, ILL.



The "HENDEY" Lathe

The Service

Capacity and Convenience

of a Hendey Lathe will prove of vital importance to your tool room.

The **"Hendey"** is accurate in the highest degree and **suited for the efficient use of watch tool chucks, stop chucks, relieving attachments, etc.**

It has the best spindle construction in its taper journals, with annular bearings and automatic oiling rings, which make for accuracy of alignment.

It has **automatic stop** for carriage working in either direction. Has reverse for carriage, controlled from apron.

Wide range of threads and feeds through mounted gearing, with ability to make gear changes for additional threads and feeds without limit.

A card will get you full particulars. Why not mail it now?

THE HENDEY MACHINE COMPANY

TORRINGTON, CONN., U.S.A.

Canadian Agents: A. R. Williams Machinery Co., Toronto, Ont.; A. R. Williams Machinery Co., 260 Princess St., Winnipeg; A. R. Williams Machinery Co., Vancouver; A. R. Williams Machinery Co., St. John, N.B.; Williams & Wilson, Montreal.

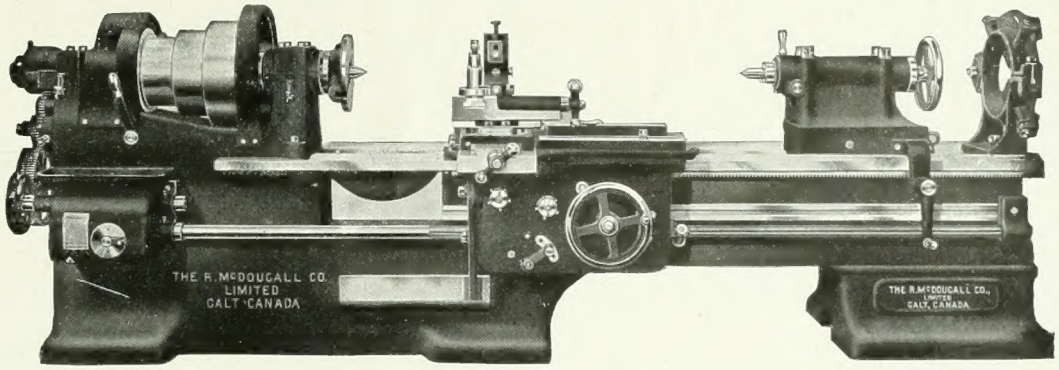
INDEX TO ADVERTISERS

Allen Mfg. Co. 55
American Machy. Exchange 48
American Pulley Co. 16
Armstrong Bros. Tool Co. 54
Armstrong Mfg. Co. 53
Baird Machine Co. 55
Baker Brothers 10
Banfield, Edwin J. 14
Banfield & Sons, W. H. 51
Barrett Machine Tool Co. 12
Beath, W. D., & Son 65
Bertram, John, & Sons Co. 1
Bignall & Keeler 20
Blount, J. G., Co. 67
Brown & Sharpe Mfg. Co. 61
Canada Machinery Agency 54
Can. Drawn Steel Co. 53
Can. Economic Lubricant Co. 17
Can. Fairbanks-Morse Co. 22
Can. Hoskins, Ltd. 4
Can. H. W. Johns-Manville Co. ....
Can. Oil Companies 16
Canadian Testing & Inspection Laboratories, Ltd. 54
Can. Winkley Co. 49
Carborundum Co. 19
Chapman Double Ball-Bearing Co. 17
Chicago Flexible Shaft Co. ....
Cleveland Pneumatic Tool Co. ....
Cook Co., Asa S. 56
Cramp, Wm., & Sons Ship and Engine Building Co. 6
Cushman Chuck Co. 71
Darling Brothers, Limited 59
Davidson, Fairley Steel Co. 51
Dennis Wire & Iron Works Co. 51
Dominion Forge & Stamping Co. 61
Drury, H. A., Co., Ltd. ....
Durant, The W. N., Co. 55
Elk Fire Brick Co. 51
Elmes Eng. Works, Charles F. 56
Fay & Scott 65
Fetherstonhaugh & Co. 47
Foss & Hill Machinery Co. ..... Inside back cover
Galt Malleable Iron Co. 55
Gardner Machine Co. 55
Garlock-Machinery 15
Garvin Machine Co. 53
General Supply Co. 13
Geometric Tool Co. 43
Girard Machine & Tool Co. 49
Globe Machine & Stamping Co. 67
Gorton Machine Co., Geo. 15
Grant Mfg. & Mach. Co. 67
Grant Gear Works, Inc. 55
Hamilton Gear & Machine Co. 54
Hanna & Co., M. A. 71
Hawkesbury Board of Trade 56
Hawkridge Brothers Company 51
Hendey Machine Co. 72
Hill, Clarke Co. 50
Holden-Morgan Co., Ltd. ..... Front Cover and 59
Hurlbut, Rogers Machy. Co. 53
International Time Recording Co. 45
Jardine, A. B., & Co. 63
Jenckes Machine Co. 12
Kellogg & Co. 3
Kennedy, Wm., & Sons 14
Landis Machine Co. 55
Lymburner, Ltd. 6
Main Belting Co. 52
Manufacturers' Equipment Co. 10
Marion & Marion 47
McDougall Co., R. ..... Inside Back Cover
McLaren Belting Co., J. C. 54
Modern Tool Co. 11
Morse Twist Drill & Machine Co. 63
Morton Mfg. Co. 51
Murchey Machine & Tool Co. 8
New Britain Machine Co. ....
New York Machinery Exchange 52
Nicholson File Co. 18
Noble & Westbrook Mfg. Co. 54
Northern Crane Works 56
Norton, A. O. 55
Norton Grinding Co. 21
Norton Company 20
Nova Scotia Steel & Coal Co. ....
Oliver Machinery Co. 67
Ontario Metal Products 48
Oven Equipment & Mfg. Co. 5
Parmenter & Bulloch Co., The 56
Perrin, Wm. R., Ltd. 6
Peter Bros. Mfg. Co. 71
Petrie, H. W., Ltd. 49
Positive Clutch & Pulley Works 55
Pratt & Whitney Co. ..... Inside front cover
Puro Sanitary Drinking Fountain Co 47
Racine Tool & Machine Co. 17
Root, C. J., Co. 55
Shore Instrument & Mfg. Co. 54
Shuster Co., F. B. 53
Southwark Foundry & Machine Co. 7
Spray Engineering Co. ....
Starrett Co., L. S. ..... Outside back cover
Stocker Machinery Co., H. A. 48
Stow Mfg. Co. 63
Tabor Mfg. Co. 55
Thwing Instrument Co. 53
Toomey, Frank, Inc. 52
Toronto Iron Works 54
Vanadium-Alloys Steel Co. ....
Vonnegut Machinery Co. 49
Vulcan Crucible Steel Co. 71
Vulcan Engineering Sales Co. 9
Wallace Barnes Co. 65
Warner & Swasey 4
Wells Bros. of Canada, Ltd. 19
Whiting Foundry Equipment Co. 61
Williams, J. H., & Co. 18
Williams Machy. Co., A. R. 43

McDougall Gap Lathes

—

Strength
Accuracy
Quality



Take a look at the next money you intend to invest in a Lathe.
Then, take a look at the money's worth we offer you in our machine.
Your money will soon come back to you in increased production and we will have the pleasure of having a satisfied user. Our machines are just as good as they look and they look good too.
We invite the closest inspection.

ARE-MAC-DEE IS A GUARANTEE

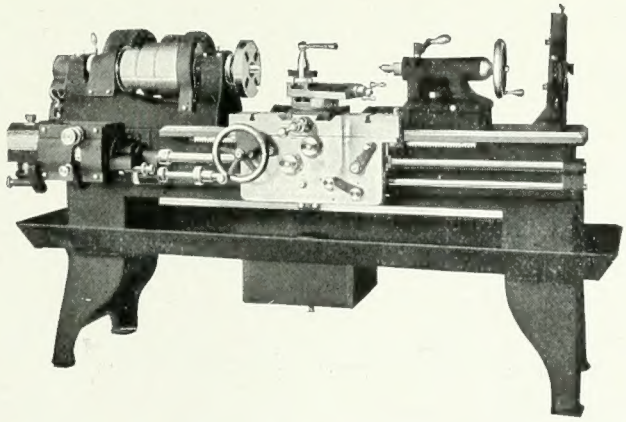
Particulars on request.

The R. McDougall Company Limited

Manufacturers

GALT, Ont., Canada

The Canadian Fairbanks-Morse Co., Limited, Sales Agents.



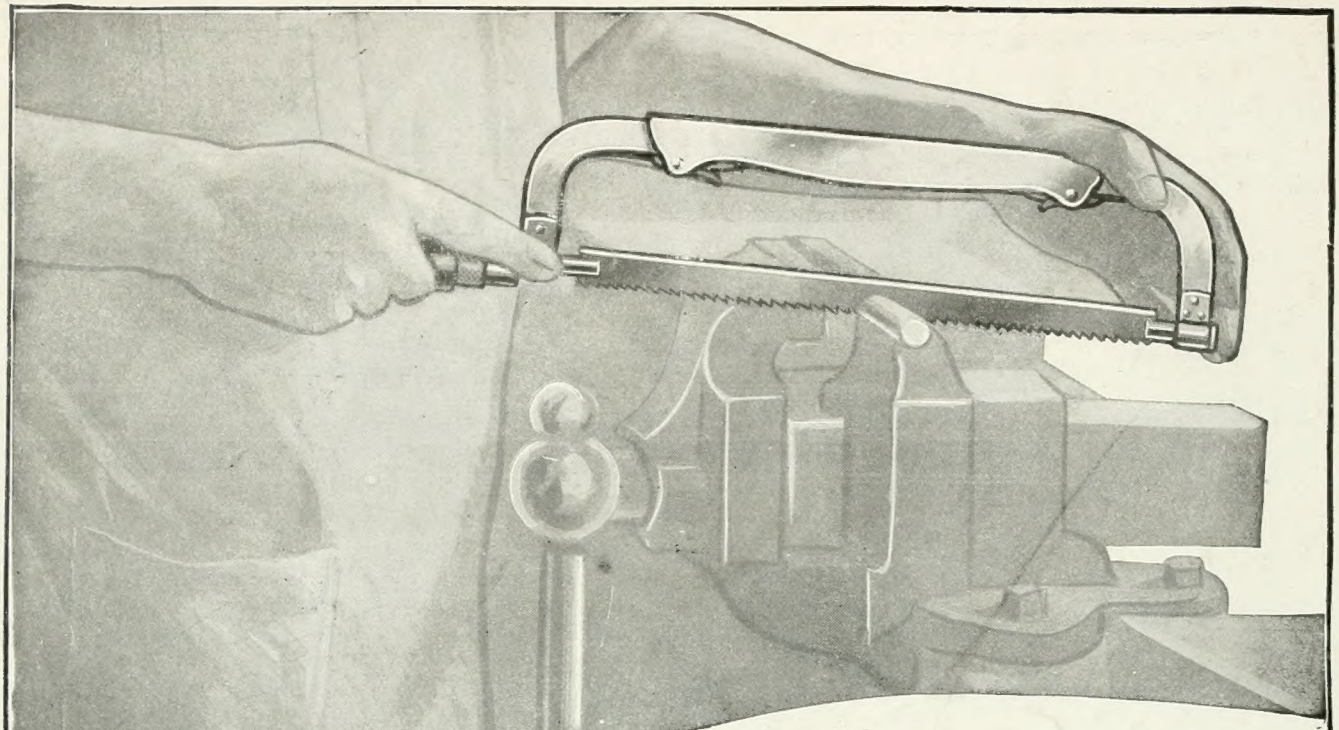
1—26″ x 14″ F. E. Reed Standard Engine Lathe
1—28-52″ x 10′ Fay & Scott Extension Bed Lathe
1—36″ Pulley Lathe
1—3′ x 36″ Jones & Lamson Turret Lathe
1—16″ x 6′ Engine Lathe
1—16″ x 8′ Engine Lathe
1—14″ x 6′ Engine Lathe
1—28″ x 48″ Fitchburg Pattern-maker's Lathe

1—Milling Machine 27″ x 19″ x 7½′
1—No. 3 Cincinnati Universal Milling Machine
1—26″ Barnes Sliding Head Drill Press
1—32″ Mechanics Sliding Head Drill Press
1—3 CWT. B & S Massey Pneumatic Hammer
1—26″ x 26″ x 6′ Iron Planer
Bed Turrets for 24″ Lathes (hand feed).

Supplies of all Kinds

THE FOSS & HILL MACHINERY COMPANY

305 ST. JAMES STREET, MONTREAL



Starrett

Hack Saws for Every Job

A Hack Saw that cuts iron pipe will not do satisfactory work in cutting sheet steel.

Good machinists know this and also know that there is a Starrett blade for every purpose. Seventeen different blades—some differ in shape and size of teeth—some in composition, some in hardness. Our free catalog tells what saw to use. Guided by this you can recommend the proper blade for any use and give real service to your customers.

We deal direct with Hardware Stores

Send for free Catalog No. 20-3 —prices and terms

The L. S. Starrett Company, Athol. Mass.

"The World's Greatest Tool Makers"

New York London Chicago